

Northern Highland- American Legion State Forest Regional Analysis

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NORTHERN HIGHLAND-AMERICAN LEGION STATE FOREST REGIONAL ANALYSIS

Wisconsin Department of Natural Resources

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PURPOSE STATEMENT

This regional and property analysis is written to support the Northern Highland-American Legion State Forest (NHAL) Master Plan revision process. Wisconsin Administrative Code Chapter NR 44.04(8)(c) requires that the Department must develop and analyze land management, recreational use, and facility development alternatives for the master plan within the context of the property's designation, the best available information regarding the purposes and benefits of the property, and a regional analysis. As a designated state forest, the purpose of the NHAL is defined by Wisconsin Statutes:

***Purposes and benefits of state forests.** 28.04(2)(a) The department shall manage the state forests to benefit the present and future generations of residents of this state, recognizing that the state forests contribute to local and statewide economies and to a healthy natural environment. The department shall assure the practice of sustainable forestry and use it to assure that state forests can provide a full range of benefits for present and future generations. The department shall also assure that the management of state forests is consistent with the ecological capability of the state forest land and with the long-term maintenance of sustainable forest communities and ecosystems. These benefits include soil protection, public hunting, protection of water quality, production of recurring forest products, outdoor recreation, native biological diversity, aquatic and terrestrial wildlife, and aesthetics. The range of benefits provided by the department in each state forest shall reflect its unique character and position in the regional landscape.*

The best available information on the property has been collected in a series of assessments. This document fulfills the requirement of a regional analysis for the Northern Highland – American Legion State Forest by addressing the economic, ecological, and social conditions, opportunities, and constraints associated with the property on a local and regional scale. The content of the regional analysis is substantially drawn from the assessments. For this analysis the NHAL region—central northern Wisconsin—is minimally defined as Forest, Iron, Lincoln, Oneida, Price, and Vilas Counties. (See Map 1: Northern Highland-American Legion State Forest Region.) In addition, other appropriate comparisons are made in relation to ecological subsections, state, national and worldwide regions.

INTRODUCTION

Central northern Wisconsin, the region surrounding the NHAL State Forest, epitomizes the “northwoods” with its vast forests, abundant lakes, wetlands, and streams, and diverse recreational opportunities. Almost half of the region is publicly owned in national, state, and county forests. The region has a rich history. Many thousands of people now call the region home and earn a living there. Abundant natural resources drive the economy of the region through the forest

products and tourism industries. Second-growth northern hardwoods and aspen forests dominate most of the uplands, while wetlands, streams, and lakes provide habitat for many species, including rare plants and animals. Millions of visitors come each year to recreate and enjoy the area's natural beauty. The NHAL, the largest state forest, plays a unique role within central northern Wisconsin. Its world-class density of lakes, characteristic sandy soils, and easily accessible location near Minocqua-Woodruff set the stage for the NHAL to play a central role in the region.

The NHAL is located in Vilas, Oneida, and Iron Counties. It is adjacent to the Turtle-Flambeau Scenic Waters Area and Lac du Flambeau Reservation to the west, and the Vilas County Forest to the east. Private non-industrial owners are by far the largest single category of forest owner in the six-county region, followed by industrial forests, the Chequamegon-Nicolet National Forest, county forests, state lands, and tribal land. Each landowner is different due to the size, location, and capabilities of their properties, and to their varied management objectives and purposes. The area is rapidly developing as land changes hands and people move, retire in the region, and build homes and an infrastructure to support the growing population.

The current changes and choices facing central northern Wisconsin are best understood in their historical context. People have lived in the area since the retreat of the last glacier, about 9,000-10,000 years ago. As Europeans moved west across the continent, a succession of Native American tribes pushed through Wisconsin, leaving a legacy of forest settlements and burial grounds. Today, descendants of these tribes continue to play a significant role in the region.

In the late 1800s and early 1900s, the vast forests of northern Wisconsin were logged and used in urban construction. This period, called the "cutover," was followed by extensive fires and some attempts at agriculture. Cutover, tax-delinquent land defaulted in large blocks to the county and cutover land was purchased by the state and federal governments. This period leaves a mixed cultural and ecological legacy. The history and culture of Native Americans, early loggers and settlers, railroads, and tourist enterprises have become the focus of some educational efforts in the NHAL and region. In the last century forests have regenerated, both through planting and other silvicultural practices and through natural regeneration. In sharp contrast to the cutover period, significantly more forest now grows each year than is removed for forest products. (Marcouiller and Mace 1998).

The natural resources of the region provide the foundation for the current economy of central northern Wisconsin. The forest products and tourism industries combined provide almost one third of the region's output and jobs. People in the region have traditionally relied on a variety of natural resources for economic sustenance and community development. Timber harvesting and nature-based recreation (hunting, fishing, hiking, camping, snowmobiling, bird watching, etc.) are sources of economic development provided by many landowners in the region, including the NHAL.

Ecologically, the region can be divided into five subsections. The Northern Highland Pitted Outwash subsection has mainly sandy soil, high lake and wetland densities, and the potential for aspen, white birch, pine, red oak, and red maple in the uplands. The NHAL falls mostly within this subsection. The Pitted Outwash contrasts with much of the other four subsections, in which lakes are less common and richer loamy soils encourage sugar maple and other northern hardwoods. Aspen is also common in every subsection in the region. A small part of the NHAL falls into the loamy-soil landscape. The forests throughout the region are significantly younger and less diverse than they were before European settlement. In the mid-1800s the Pitted Outwash upland forests were dominated by red and white pine. The rest of the region was dominated by hemlock-hardwoods. Disturbances such as fire, wind, insects, and disease helped shape the forest.

Fire was an especially important agent of disturbance in the Pitted Outwash. Today a variety of landowners share different pieces of the region, with a variety of management objectives and ecological possibilities.

The large number of lakes and wetlands on the NHAL provide habitat for concentrated populations of bald eagles, osprey, common loons, and river otters. Much of the wildlife on the NHAL is typical of the region. The NHAL is home to forest game species such as deer, black bear, ruffed grouse, showshoe hare, red fox, bobcat, and beaver. Rare animals such as the timber wolf, many species of birds, and various aquatic and terrestrial insects, mussels, fishes, amphibians, and one reptile species can be found on or near the property. Rare species of plants and animals are particularly abundant in the wetlands.

The diversity of recreational opportunities and beautiful landscapes of central northern Wisconsin attract millions of visitors each year. The Minocqua-Woodruff area is a booming hub for the tourism and recreation industry. About 2 million visitor-days are spent on the NHAL alone. The sparkling lakes, vast forests, abundant wildlife, campgrounds, and many trails bring visitors to the NHAL year after year. Outdoor recreation on the NHAL has shown a steady increase in most uses over the past decade, with a related increase in user conflict.

This is a region that is valued for more than the sum of its parts to millions of residents and visitors. The Northwoods is a place where people still coexist with the black bear, timber wolf, bald eagle, and loon. It is a special landscape with a distinctive rustic character that has shaped the thinking and work of our great conservation writers and activists including Aldo Leopold and Sigurd Olson.

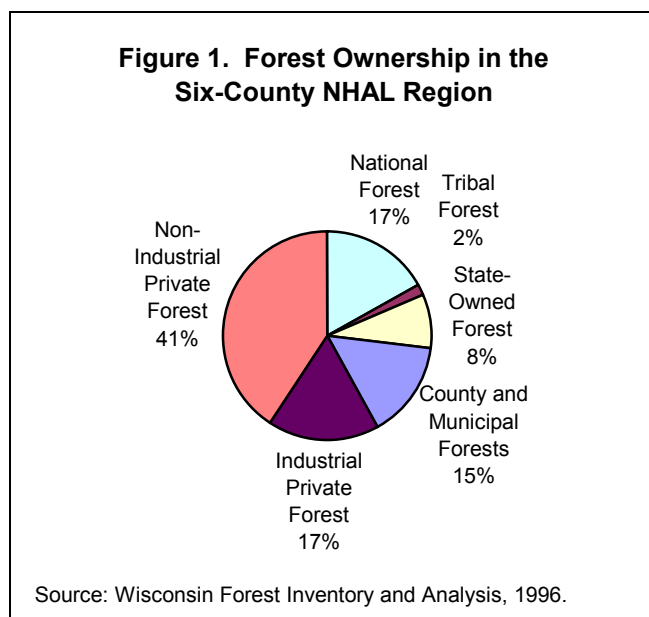
The same natural treasures and heritage that attract people to live, work and play in the region also create some of the stresses and strains the region faces. Change has come rapidly to central northern Wisconsin. Intensive lakefront development is straining water quality. Forestland ownership is being subdivided. Many Northwoods communities are rapidly expanding due to the economic boom of the late 1990s. Increased tourism and recreational activities are placing pressure on land managers and other recreation providers. Planning for the NHAL State Forest requires a regional perspective on land ownership, cultural resources, socioeconomics, ecological capabilities, and recreation. This examination of the various roles of the NHAL in central northern Wisconsin highlights significant opportunities and constraints for the management of the NHAL, and will contribute to sound, long-term ecosystem management planning.

LAND OWNERSHIP AND LAND USE PATTERNS

LAND OWNERSHIP

The NHAL State Forest is located in central northern Wisconsin within portions of Vilas, Oneida and Iron Counties. The NHAL is by far the largest state-owned property in Wisconsin. The total acreage within the NHAL boundary is approximately 345,000 acres. The current publicly owned acreage is about 225,000 acres, which covers parts of three counties and 14 townships. There are also approximately 48,000 acres of surface water (in over 900 lakes) and about 75,000 acres of private ownership within the NHAL boundary.

The surrounding six-county region is made up of private landowners (60% of forests) and public landowners (40% of forests). (See Figure 1 and Map 2: Land Ownership in the NHAL Region.) Public land includes the Chequamegon-Nicolet National Forest (CNNF), county and municipal forests, Willow Flowage Scenic Waters Area, Turtle Flambeau Flowage Scenic Waters Area, Powell Marsh State Wildlife Area, and the Bearskin State Park Trail, and other state lands. Many of these public lands are adjacent to one another. Private lands include non-industrial private forests, industrial forests, and tribal lands. Large private landowners within the boundary of the NHAL include the Wisconsin Valley Improvement Company (WVIC) with about 4600 acres above the high water mark and an additional 1000 acres outside the NHAL boundary in Oneida County.



LANDOWNER ROLES AND OBJECTIVES

The region surrounding the 225,000 acre NHAL is characterized as rural, heavily forested, and dotted with thousands of lakes, many rivers and streams, and considerable public land. Each landowner has different management objectives and different impacts on the natural communities, recreational opportunities, extent of road and building development, and flow of timber products within the region.

National Forests

The Chequamegon-Nicolet National Forest (CNNF) represents Wisconsin's largest blocks of public land. The Chequamegon Unit of the CNNF is located to the west and southwest of the NHAL and encompasses approximately 845,000 acres. To the east and southeast lies the Nicolet Unit of the CNNF. The Nicolet has approximately 661,000 acres. The national forests have a broad multiple use purpose, balancing recreation and other objectives with the production of timber products.

A portion of the nearly one million acre Ottawa National Forest in the Upper Peninsula of Michigan falls into the ecological region for the NHAL. The Ottawa National Forest also has a multiple use purpose.

Tribal Lands

The 44,000 acre Lac Du Flambeau Indian Reservation is adjacent to the western border of the NHAL. The lands are managed by the Lac Du Flambeau Indian Tribe and the Bureau of Indian Affairs for the benefit of the tribe. These lands have significant conservation benefits for the region. The tribe manages 126 lakes, a fish hatchery and forestry programs.

The Sokaogon Chippewa (Mole Lake) Indian Reservation to the east of the NHAL encompasses about 1,731 acres. These lands also have significant conservation benefits for the region, lying near the headwaters of the Wolf River, and containing many miles of trout streams, lake shore and wild rice beds.

State Forests

Wisconsin's state forests are substantially smaller than the national forests but share many similarities in their overall multi-use purpose and management, including economic, ecological, and social factors. The purpose of state forests is defined on page 2. On the whole, recreators consider state forests to be less remote and somewhat more developed than national forests but more remote and less developed than state parks. State forests are considered a primary provider of silent-sport recreational opportunities (e.g. hiking, hunting, fishing, watching wildlife). The NHAL is the only state forest in the region and by far the largest state forest in Wisconsin.

State Parks

Council Grounds State Park is located in southern Lincoln County. State parks are managed mainly for recreational benefits, including camping, trails, and hunting.

Other State Lands

Other state lands include scenic waters areas, state land commission parcels, state wildlife areas, state natural areas, state park trails, fisheries areas, and fish rearing stations. The Willow Flowage Scenic Waters Area contains 16,000 acres in Oneida County south of the NHAL. The Turtle Flambeau Scenic Waters Area contains 31,000 acres bordering the NHAL to the west in Iron County. They are designed to protect the scenic beauty of the flowages while managing the forest and water resources and providing for recreation. The Board of Commissioners of Public Lands manages 20,900 acres in Oneida County, 19,700 acres in Forest County, 6,800 acres in Iron County, 5,400 acres in Vilas County, and 400 acres in Lincoln County. These lands are scattered and variable, consisting of lake bed, wetlands, and uplands with poor or difficult access. About eleven state wildlife areas exist in the region, including Powell Marsh, Thunder Lake, Little Rice, Wood Borough, and New Wood. State wildlife areas preserve and manage important habitat for wildlife including wetlands. They provide opportunities for hunters, trappers, hikers, wildlife watchers, and others with minimal facilities. State natural areas (SNAs) are designed to represent the variety of Wisconsin's native landscapes for education, research, and the long-term protection of biological diversity. SNAs can be owned by state, county, or federal governments or other organizations. Vilas County has 13 SNAs, Oneida has 10, Iron has 6, and Forest, Price, and Lincoln Counties have 5 or fewer. SNAs on state land in these counties range in size from 21 to

3,200 acres. The Bearskin State Park Trail is just west of the NHAL. Several small fisheries areas and fish rearing stations exist, including the Presque Isle Rearing Station north of the NHAL in Vilas County.

County Forests

The county forests in Forest, Iron, Lincoln, Oneida, Price, and Vilas Counties also have a multiple use purpose, but are more directed toward management for the production of timber products than other public properties. Combined, the county forests in the region make up 463,000 acres. These forests also attract large numbers of hunters, provide a variety of trails, and contribute a high percentage of the snowmobile and ATV riding opportunities.

Private Industrial Forests

Industrial forests (540,000 acres in the region) are an important land ownership group with the obvious management purpose of producing forest products. Many of these lands are open to public recreation through the Managed Forest Law (MFL) or Forest Crop Law (FCL).

This category of land has recently undergone a dramatic shift in land ownership. Beginning in the mid to late 1990s, thousands of acres of industrial forests in the north have been sold. In some cases, other forest products companies have purchased these lands. In 1999, the state of Wisconsin acquired 32,000 acres in the vicinity of the NHAL in a purchase that has been dubbed the “Great Addition.” Increasingly, however, private industrial forest is being sold to non-industrial private owners, whose goals for forest management, wildlife habitat and recreational potential may be different from past practices on the land. In many cases, development on these lands is increasing.

Private Non-Industrial Land

Private non-industrial forests represent 1,270,000 acres in the region. As land purchased for recreation becomes more popular, property values in the NHAL region have increased. Many private non-industrial owners are purchasing land that was previously industrial forest. A small percentage of private non-industrial land is open to public recreation. Generally, private non-industrial land is more developed than public land.

POPULATION TRENDS

Central northern Wisconsin is a region in transition, as population and economic growth has affected land use and ownership patterns. Figure 2 refers to Census results released in March, 2000.

Figure 2. Census Results, March 2000

Wisconsin County	Census population 2000	Population increase 1990-2000	Percent population increase 1990-2000
Vilas	21,033	3,326	19%
Oneida	36,776	5,097	16%
Forest	10,024	1,248	14%
Iron	6,861	708	12%
Lincoln	29,641	2,648	10%
Price	15,822	222	1%
Regional Total	120,157	13,249	12%

According to Census 2000 data, the six-county region contains a resident population of approximately 100,000 people and has witnessed an average population growth of 12% over the past decade. The most intensive growth has taken place in Oneida and Vilas Counties—those closest to the NHAL State Forest. These numbers *do not include* seasonal populations, which often far exceed resident populations. In Vilas County for example, the Wisconsin Department of Revenue reports that 58% of homes are intended primarily for recreational use. Data for Vilas and Oneida Counties indicate that in 1995 there were 16 cabins per mile of privately owned shoreline on lakes greater than 100 acres, compared to 9.5 in the 1960s. (WDNR, *Shaping the Future*.)

The increased demand for housing in the northwoods has caused an increase in property values. The Wisconsin Department of Revenue found that land values appreciated in a four county study region (Iron, Oneida, Price, and Vilas Counties) an average of 15.5% between 1998 and 1999. Shoreland ownership is in particular demand. According to the Department of Revenue, housing values in the northwoods far outpaces those in the rest of the state. (Milwaukee Journal Sentinel 2000)

The NHAL region accommodates millions of visitors each year, including residents, large seasonal influxes of day visitors, short-stay vacationers and second vacation-home owners. The accelerated growth brings more residents and tourists to the area, increasing the pressure on public lands to support outdoor nature-based recreation. The Minocqua-Woodruff area, located just outside the NHAL's western border, is one of the most rapidly growing tourist areas in the state. New development of housing and tourist infrastructure has been extremely rapid. Parcelization of forest ownership is increasing, along with shoreline development, wetland removal, and road construction and expansion. People move to the northwoods for its undeveloped natural character, in the process developing a small piece of the landscape and making more scarce the very resources they moved to the area to enjoy. This trend focuses more intensive pressure on public land, and the centrally-located and highly accessible NHAL State Forest in particular.

Because property values are rapidly increasing, purchasing additional public lands is becoming very costly. As managers plan for future expansion of the NHAL property boundary in northern Vilas and Iron counties, they will likely compete for those lands with real estate and other developers hoping to cash in on people's dream of owning a scenic, lakefront home in the northwoods.

CULTURAL RESOURCES AND EDUCATION / INTERPRETATION

CULTURAL RESOURCES

The cultural and historical resources of the region are the legacy of early native peoples and their descendants who have lived in the area for thousands of years, and the people of European descent who came to the region for fur, timber, recreation and to settle permanently. Remnants of their lives and stories of their history enrich the landscape of central northern Wisconsin and offer opportunities for education of residents and visitors to the region.

The earliest evidence of human habitation in the area dates to 9,000 – 10,000 years ago, not long after the recession of the most recent ice sheet. (Egan-Bruhy 2001) The natural resources of the region provided food such as fish, small and large game, wild rice, wild berries, and maple sap. These were supplemented somewhat by agriculture. Transportation was facilitated by the network of lakes and rivers, and fresh water was abundant. Knowledge that accumulated for centuries supported tribes' subsistence practices. Wild rice harvest, fishing, hunting, some agricultural production, and wild berry harvest were parts of the lifestyle of these early residents of the area. (WDNR, *Shaping the Future*.)

When European contact with North America occurred in the 1600s, the people of Wisconsin included the Winnebago, Menominee and the Santee Dakota (or Sioux). The following centuries saw a major movement of Native American tribes westward into Wisconsin. Many tribes left a legacy of forest settlements and burial grounds as they moved west, allowing for some documentation of their movement. Among the tribes moving west into Wisconsin were the Ojibwe (or Chippewa), who were made up of many bands. Through battles with the Santee Dakota, the Ojibwe pushed into western Wisconsin and northern Minnesota. (Mason 1988) Through cession treaties with the United States government in the mid 1800s, the Ojibweg¹ sold vast tracts of land in Michigan, Wisconsin, and Minnesota for small amounts of money, equipment, and schooling. The tribe retained rights to hunt and gather in the ceded territory. (GLIFWC 1998)

The cultures and history of Native Americans interests many and provides an opportunity for education both on the NHAL and in surrounding areas. Early use of the area by native peoples is documented through research on over 60 sites on the NHAL alone. Researchers recently completed a survey of settlements on the shores of Trout Lake. This study became the focus of an educational effort, when researchers held educational programs for the public. A brochure on the archaeology of Trout Lake is being developed. (Egan-Bruhy 2001, Egan-Bruhy pers. comm. 2002) In addition, mounds exist in several locations on the NHAL. The Environmental Education and Awareness assessment (Fannucchi 1998) identified an opportunity to create signs identifying and interpreting some of these mounds.

Today, the reservation for the Lac du Flambeau band (part of the Ojibwe tribe) borders the NHAL to the west. Many Native Americans participate in gatherings such as pow-wows, creation of Native American artwork, and a continued use of natural resources through hunting, fishing, and gathering bark and medicinal plants. The Lac du Flambeau cultural center and museum offers

¹ Ojibweg is the plural of Ojibwe. (Great Lakes Indian Fish and Wildlife Commission 1998)

educational programming to visitors. Lac du Flambeau has also undertaken a major effort to identify and preserve historical and cultural sites on the reservation.

The cultures and history of early loggers and settlers is another source of interest in the region. Beginning in the 1890s, white pine in the vicinity of river systems was logged and transported downstream to larger mills in Wisconsin. A second wave of logging occurred as the railroad system reached the north in the early 1900s. Lumbermen established logging camps where crews lived and worked throughout the winter. (Bogue 1989) As for the culture of the loggers, Bogue writes that “in the wake of the great lumbering era something of a romantic afterglow remains in popular thought, rather than the stark realities of hard work, danger, and the fact that many lumberjacks were perfectly ordinary Midwestern farmers and rather poor immigrants trying to earn money...” (Bogue 1989) One reminiscence describes the rivermen as “picturesque and heroic figures in truth, hard-living, hard-drinking, hard-fighting, blasphemous pioneers.” (Bogue 1989) This folklore and an interest in pioneer history are apparent in the Northwoods today, as residents and visitors are invited to eat pancakes like a lumberjack, watch lumberjack shows and contests, and ride the lumberjack steam train.

While the supply of lumber built the cities of the nation, the face of the forest was dramatically changed. Much of the area’s natural beauty was gone, and the stumps and slash left behind provided fuel for the forest fires that followed. Wildfires were frequent and uncontrolled. The land lay unproductive and lumber companies decided to sell. In many cases the State Legislature of Wisconsin provided the financial means to acquire large land holdings, beginning in 1907. (WDNR, *Shaping the Future*.)

With railroads established from Milwaukee and Chicago to central northern Wisconsin, recreation and tourism grew. Wealthy urbanites came north for rest and relaxation in the open air. Lodges around Star Lake and Plum Lake were particularly popular. Camp American Legion was founded in 1925 and continues today as a retreat for veterans of all incomes in need of rest and recuperation. It is located within the southern part of the NHAL, and led to the naming of that part of the forest in 1929.

Regionally, at least one educational center focuses on the history of early European settlement, including logging and railroads. Educational programs, books, and brochures are available that also address this history. On the Chequamegon-Nicolet National Forest, about 24 archaeological sites and historic structures have been interpreted for public education. (USDA Forest Service 1998a)

On the NHAL, old logging camp sites, narrow gauge railroad corridors and Civilian Conservation Corps (CCC) camps exist. (Fannucchi 1998) Educational programs at one NHAL nature trail highlight the history of logging in the area. Interpretive signs for this trail are being developed. (Buller, S., pers. comm. 2001)

The cultural resources of the NHAL and surrounding region are best understood in light of the region’s history. Native Americans, loggers, early pioneers, and tourists all came to central northern Wisconsin for its natural resources, scenery and ability to renew the spirit. While efforts have been made to educate visitors on the cultural resources of the area, more opportunities are available to incorporate cultural resources into education and outreach efforts on the NHAL, linking the state forest with the Lac du Flambeau reservation, historic and prehistoric landmarks, and the history of loggers, pioneers, and early visitors.

EDUCATION / INTERPRETATION ON NATURAL RESOURCES

Education and interpretation efforts in the region also focus on natural resources. Several private outdoor education centers provide hands-on learning for children and adults. Treehaven is an educational facility located between Tomahawk and Rhinelander that is run by the University of Wisconsin-Stevens Point. It offers a variety of educational programs. The Kemp Natural Resources Station near Minocqua provides outdoor education and research for the University of Wisconsin-Madison. Trees for Tomorrow uses field studies and classroom presentations to teach conservation values and demonstrate benefits of contemporary resources management to students and teachers. It is an independent, nonprofit organization in Eagle River which was founded by and has derived much of its financial support over the years from the forest products and electric utility industries. (Trees for Tomorrow Webpage) The Northwoods Wildlife Center is a not-for-profit wildlife rehabilitation hospital that provides educational programs and tours. The North Lakeland Discovery Center is located in Manitowish Waters within the boundary of the NHAL. It provides a variety of natural, cultural, historical, and recreational programs for children and adults and offers a conservation camp setting with a main lodge, amphitheater, cabins, classroom area, and recreational field. Additionally, many private individuals offer naturalist programs.

Few facilities exist on public land in the region. Council Grounds State Park in southern Lincoln County has a small nature center and a seasonal naturalist. The CNNF has district offices with brochures and seasonal naturalists when funding is available. County forests in the region do not have visitor centers or naturalist programs. One Price County Park has naturalist programs during the summer. Local Chambers of Commerce offer tourist and recreation information, but do not provide natural resources based education.

Two year-round visitor centers are outside of the six-county NHAL region, but represent the most developed interpretive facilities in northern Wisconsin. The Northern Great Lakes Visitor Center is located in Ashland and focuses on Great Lakes education. It is jointly funded and run by the U.S. Forest Service, the National Park Service, the Wisconsin Historical Society, University of Wisconsin Extension, and the Friends of the Center Alliance, Ltd. The Florence Natural Resources and Wild Rivers Interpretive Center is another year-round visitor center. It is designed as a focal point for the discussion and promotion of balanced resource utilization in Florence County.

The NHAL currently provides four interpretive trails, a rustic nature center, and seasonal naturalist programs at campgrounds. Due to the limited year-round visitor centers in the NHAL region and to the prominence and popularity of the NHAL State Forest, the NHAL has an opportunity to expand its facilities to educate the public on natural resources and forest management. Although the Environmental Education and Awareness Assessment did not identify opportunities for new facilities, it did develop a major theme for education on the NHAL, which is "People and the Forest Resource." Educational facilities and programs have the additional opportunity of educating the public on the niche of the NHAL as a state forest as well as on current trends and issues facing the property and region.

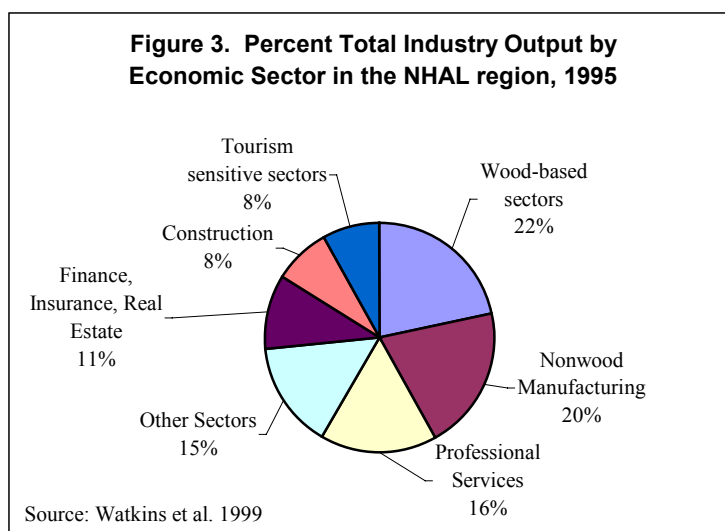
SOCIOECONOMICS

The natural resources of the NHAL region—its trees, land, water, and wildlife—provide a basis for its economic and social activity. The forest resources of central northern Wisconsin provide important public goods to society as a whole in the form of functioning ecosystems, habitat diversity, quality-of-life amenities, and the maintenance of resources for future generations.² The forests also provide important private goods that support community vitality and contribute substantially to regional household income. The two main sources of forest-based economic activity in the region are the timber and wood products industry and the tourism and recreation industry. People and households in the region, particularly in rural areas, have traditionally relied upon the natural resource base for economic sustenance. Understanding the role of the NHAL and the region within local economies is critical to understanding not only the impact of forest management decisions on community development, but the perspectives of those dependent on forest resources for economic sustenance.

The timber and wood products industry represents an important economic engine for the region and, when combined with tourism, contributes a significant portion of the household income generated within this resource-dependent economy. Timber harvesting also represents a traditional lifestyle for some people in the region.

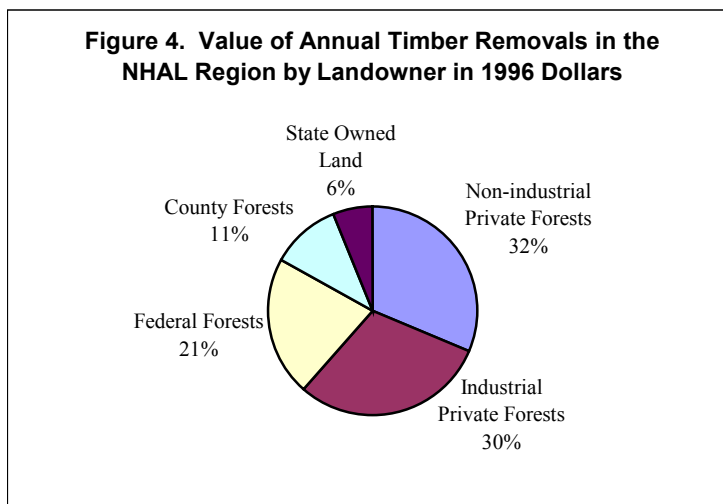
The Socioeconomics for the NHAL State Forest Region assessment documents the contribution of timber and recreation to the region's economy. (Watkins et al. 1999) This assessment defined the region as six Wisconsin counties (Iron, Forest, Lincoln, Oneida, Price, and Vilas) plus one Michigan county (Gogebic). It found that almost 30% of the regional output and 27% of the region's jobs are somehow tied to either wood products or tourism-sensitive sectors. Indeed, this region is much more reliant upon wood products and tourism than Wisconsin as a whole. Statewide estimates show that the combined wood-products and tourism-sensitive sectors comprise only 12% of state output and 18% of statewide jobs.

Wood-based sectors, which include timber production, primary wood processing, and secondary and reconstituted wood-products (pulp and paper and waferboard), combine to be the largest economic sector in the region. (See Figure 3.) In 1995, wood-based sectors accounted for approximately 22% of the region's industry output (roughly \$1.07 billion of \$4.92 billion). Nonwood manufacturing and professional services are the second and third largest economic sectors by industry output, while tourism sensitive sectors are sixth (approximately \$3.92 million out of \$4.92 billion).



² Watkins et al. 1999

In this region, the annual value of timber removals in 1996 was approximately \$33 million, divided between five major types of landowners. (See Figure 4.) Industrial and non-industrial private forests are each the origin of about one-third of this stumpage value, while approximately 20% originates on federal land and 11% on county land. Of this \$33 million, roughly \$2 million, or 6%, was harvested from state properties (primarily the NHAL State Forest). All revenue generated from timber harvests on the NHAL is not kept by or budgeted to the NHAL, but is deposited in a segregated account called the Forestry Account. These revenues are appropriated by the Wisconsin legislature for a variety of statewide forestry-related programs. Over a four year period (1992-1996), the NHAL contributed 4.2% of the volume of timber harvested in the region. It contains 4.7% of the forested acreage in the region.



On the NHAL, foresters mark the timber to be sold and the successful bidder or timber producer is responsible for marketing and selling the wood products they cut. Timber can be sold either by the cord (mainly for pulpwood) or by thousand board feet as sawtimber. About 95% of the volume harvested on the NHAL is sold by the cord. On the NHAL, this timber is about one-third aspen, one-third hardwoods, and one-third mixed pine and fir. Cord products include pulpwood for paper products, mini-sawlogs for 2x4s, popsicle sticks, tongue depressors, and shipping pallets. Wood is also chipped on site for pulp or fuel markets. About 5% of the total volume harvested on the NHAL is sawtimber. About 80% of this sawtimber is mixed pine and 20% is mixed hardwoods. Sawtimber can be sold to lumber mills for telephone poles, cabin logs, and landscape timbers or sold as veneer logs. (Olsen, J. pers. comm.) Within the seven-county region, about 75% of the volume harvested is pulpwood and almost 25% is sawtimber. (Watkins et al. 1999). One reason for the relatively low percentage of sawtimber harvested on the NHAL is that areas suitable for this product size are being managed on an extended rotation that has resulted in a harvest deferral in recent years.

Timber harvested from the NHAL State Forest is intermingled with timber supplies from other landowners in the region. Given the relatively small proportion of regional timber volumes harvested from this property (roughly 4%) and the fluidity of timber flows within and outside the region, it is unlikely that regional wood-using industries would be significantly impacted by expansions or reductions in state-offered timber sales. Local logging operations, however, could be significantly affected. Over the long run, changes in the supply of timber stumpage (either type or volume) from public lands will have an effect on stumpage prices not simply within this region, but throughout the Lake States.

The resources of forests in the region provide a rich diversity of other economic opportunities. Though much less significant economically than timber harvesting, the gathering and use of forest and wetland resources such as wild rice, fish and game animals, firewood, cranberries, maple syrup, small branches for furniture, wreaths, and other crafts, animal pelts and antlers, and berries, mushrooms, nuts, and medicinal herbs and bark supplement household incomes and support local

economies. They are all examples of people's strong ties to the land. Many of these activities also serve to strengthen social bonds and enrich the culture of northern Wisconsin. On the NHAL, permits are sold for gathering firewood, balsam boughs, Christmas trees, small branches for furniture and crafts, and for ricing. The demand for non-timber forest products has been expected to increase, due to a growing interest in traditional food gathering. (USDA Forest Service 1998b)

Recreation is another important driver of regional economic activity. The Recreational Supply and Demand assessment reports that tourism is increasing in the NHAL region. The value of forest-based recreation to regional economies comes from the additional demand for local businesses that occurs when people from outside the region visit with the expressed intent of undertaking forest-based recreation. Tourism-sensitive sectors accounted for 8% of regional industry output in 1995 (roughly \$392 million of \$4.92 billion). Only a portion of this output can be directly attributed to forest based recreation. Economic benefits from forest-based recreation come from a variety of sources, including hotels and cabins, restaurants, recreation outfitters, and local guides and naturalists. On the NHAL, \$640,000 in recreational revenue was collected in 1998 from camper fees, visitor stickers, and trail passes. This income goes into the Forestry Account for the state along with income from timber harvests on the NHAL. Clearly the region's natural resources are important to recreation and the economic impacts of recreation. However, the specific economic contribution of recreation facilities on the NHAL compared to those in the region is not easily quantified.

While the silent-sport user group has the lowest spending rate per household, it contains the highest total number of households (66%) and makes the largest total contribution to the local recreational economy (38%). In contrast, the motorized user group makes up 12% of the households in the region and is responsible for 29% of the total recreational economic activity.

According to the Socioeconomics for the NHAL State Forest Region assessment, both wood-based and tourism-sensitive industries contributed to jobs in the region. Within the wood-based sectors, reconstituted wood products (pulp and paper and waferboard) dominate with over one-half billion dollars of annual output representing just over 2,300 total jobs in the region. With respect to the region's tourism sensitive sectors, the tourism retail sector dominates with almost one-quarter billion dollars of output representing roughly 8,500 jobs. To be sure, the jobs in tourism retail firms are not the same types of jobs offered by the reconstituted wood products sector. In general, tourism retail jobs are more apt to be seasonal, part time and of relatively lower wage, averaging \$9,600 per year, when compared to forest industry jobs at \$29,700 per year.

A recent study of the economic impacts of woodland use for recreation and timber (Marcouiller and Mace 1999) suggests that timber production and recreational use of forests are generally compatible land uses. The keys to compatibility are "silvicultural methods, appropriate timing of harvesting activities, and thoughtful natural resource interpretation programs." This is more apt to be the case with hunters and motorized recreationists than with the broad category of silent-sport forest recreationists. Furthermore, forest-based recreationists generally feel that balanced use (for both timber and recreation) is an important component of local economic conditions for communities in this region and that forest land managers should take into account these localized effects on rural populations.

Forest-based recreation, and thus its economic impact, varies by season. For instance, hiking and camping are especially popular in the summer, hunting and trapping in the fall and into the winter, snowmobiling and cross country skiing in the winter, and wildlife watching year-round.

Water-based recreation is uniquely important to landowners in and around the NHAL, and for the NHAL itself. Due to the high density of lakes in this area, fishing and boating attract the greatest numbers of visitors. The NHAL provides undeveloped shorelines and over 100 boat landings. The Department works through several programs to maintain water quality and manage fish and other aquatic and wetland species, and understands the ecological and economic value of lakes and lake access.

People and households in rural resource-dependent regions of Wisconsin have traditionally relied upon the natural resource base for economic sustenance. The NHAL lies at the heart of northern Wisconsin, supporting local communities through both forest-based recreation and forest products. Management of the forest has an impact on the socioeconomic ties that bind these communities and the people who visit them to the resources of the forest.

ECOLOGICAL CAPABILITIES

The ecological characteristics of the NHAL and region are the result of their history, from glaciers to the “cutover” period to current forest management. The size, central location, ecological capabilities, and existing biodiversity of the NHAL indicate its importance in the regional ecology of central northern Wisconsin.

The most recent glaciers receded from northern Wisconsin about 10,000 years ago, leaving a pitted outwash plain and sandy deposits in much of what is now Vilas and Oneida Counties, and loamy soils with a varied topography in most of the surrounding region. The pitted outwash has one of the highest concentrations of fresh water lakes in the world. Glacial activity is also responsible for many of the rivers and streams in the pitted outwash, which form the headwaters for two of Wisconsin’s major rivers.³

The sandy pitted outwash forests have depended on disturbances such as fire, along with wind, disease, and insects. Prior to European settlement, this area gave rise to one of the upper Midwest’s extensive red and white pine dominated forests with a mixture of white birch, aspen, and jack pine. The rest of the region has richer, loamy soils, less disturbance, and gave rise to hemlock-hardwood forests rather than pine forests.

In the late 1800s and early 1900s, northern Wisconsin was subjected to catastrophic logging of the vast pine forests and later the hemlock-hardwood forests. These decades are described as the “cutover” period, in which hardly a tree remained standing in the entire upland forest. The cutover was followed or accompanied by severe fires that burned away topsoil and many seed sources. Many areas were cleared for agriculture. After the forests were removed, the land burned, and most of the agriculture failed, large tracts of land defaulted to county governments and were purchased by federal and state governments. Fires were suppressed and an aggressive reforestation program began, involving the first state tree nursery on the NHAL and the Civilian Conservation Corps. Now, a century later, the region once again features extensive forests, but they differ considerably from the presettlement landscape. Secondary species such as aspen have replaced the pine and hemlock-hardwood forests. Fire suppression, high populations of deer and hare, tree diseases, forest floor and seedbed alterations, and management goals of maintaining aspen and

³ Epstein et al. 1999

sugar maple forests have limited the regeneration of one or more trees, including white pine, eastern hemlock, yellow birch, northern white cedar, and white birch. (Eckstein et al. 2001)

The NHAL lies at the heart of this region in the sandy pitted outwash, an area rich with lakes and wetlands. The uplands have the ecological capability of supporting several dominant tree species. Its forests support wildlife typical of the region, including forest game species such as deer, black bear, ruffed grouse, showshoe hare, red fox, bobcat, and beaver. The size of the NHAL and its proximity to other large properties provide ecological connections across forested landscapes, habitat for animals with landscape level habitat needs, and habitat for migratory birds on a state, multi-state and continental level. (WDNR, *Shaping the Future*) The property includes some of the state's older and most extensive remnants of white pine and red pine forest communities. There are over 900 lakes within the NHAL boundary, which includes a globally important concentration of kettle lakes. There is an exceptionally diverse and significant array of wetland and aquatic features which provide habitat for many rare aquatic plants and animals as well as regionally high concentrations of bald eagles, osprey, and common loons.

This analysis will determine the ecological role of the property in the region by comparing the ecological capabilities of five areas (subsections) surrounding and encompassing the NHAL with the ecological capabilities of the NHAL itself. Ecological capability refers to the potential of an area to support or develop biotic communities, dependent on the area's abiotic attributes, its flora and fauna, its ecological processes, and disturbances within and upon the area. (WDNR Chapter NR 44). This analysis defines the significance of the NHAL's resources within the region in order to assist in the identification of management opportunities that could maintain and enhance ecological resources on the NHAL in a regional context.

A number of different methods and data sources were used to assess the ecological attributes of the NHAL and region. Analysis for the NHAL relies upon data from WDNR forest reconnaissance records (recon), the Regional Ecology Assessment which describes the National Hierarchical Framework of Ecological Units (NHFEU), the Biotic Inventory of the NHAL which reports findings from Natural Heritage Inventory (NHI) surveys, the Community Restoration and Old Growth (CROG) Assessment, and the Biodiversity Assessment. Analysis for the region uses data from the Wisconsin Forest Inventory and Analysis (FIA), WISCLAND, and the NHFEU. Combining findings from the various data sources aids in evaluating the complete range of the NHAL's and surrounding region's ecological capabilities, and appropriate opportunities for landscape scale ecosystem management.

REGIONAL ECOLOGICAL SUBSECTIONS

To compare the ecological characteristics of the NHAL with those of the region, the Regional Ecology Assessment (Bartelt et al. 1999) used the National Hierarchical Framework of Ecological Units (NHFEU). This framework employs factors such as landform, soil, vegetation patterns, and climate to group areas with similar characteristics at national, regional, and local scales. These areas, or ecological units, have similar ecological capabilities. At a broad scale, the NHAL and its ecological region are located within a province called the Laurentian Mixed Forest. This province includes the area across the northern portion of the Lake States and extends northeastward to Maine. A section of that province called the Northern Highlands Section encompasses much of central northern Wisconsin. This section includes four of the five subsections described in this analysis. The Southern Superior Uplands lies just northern of the Northern Highlands Section in

northern Wisconsin and the Upper Peninsula of Michigan. One of the five subsections discussed here falls into the Southern Superior Uplands.

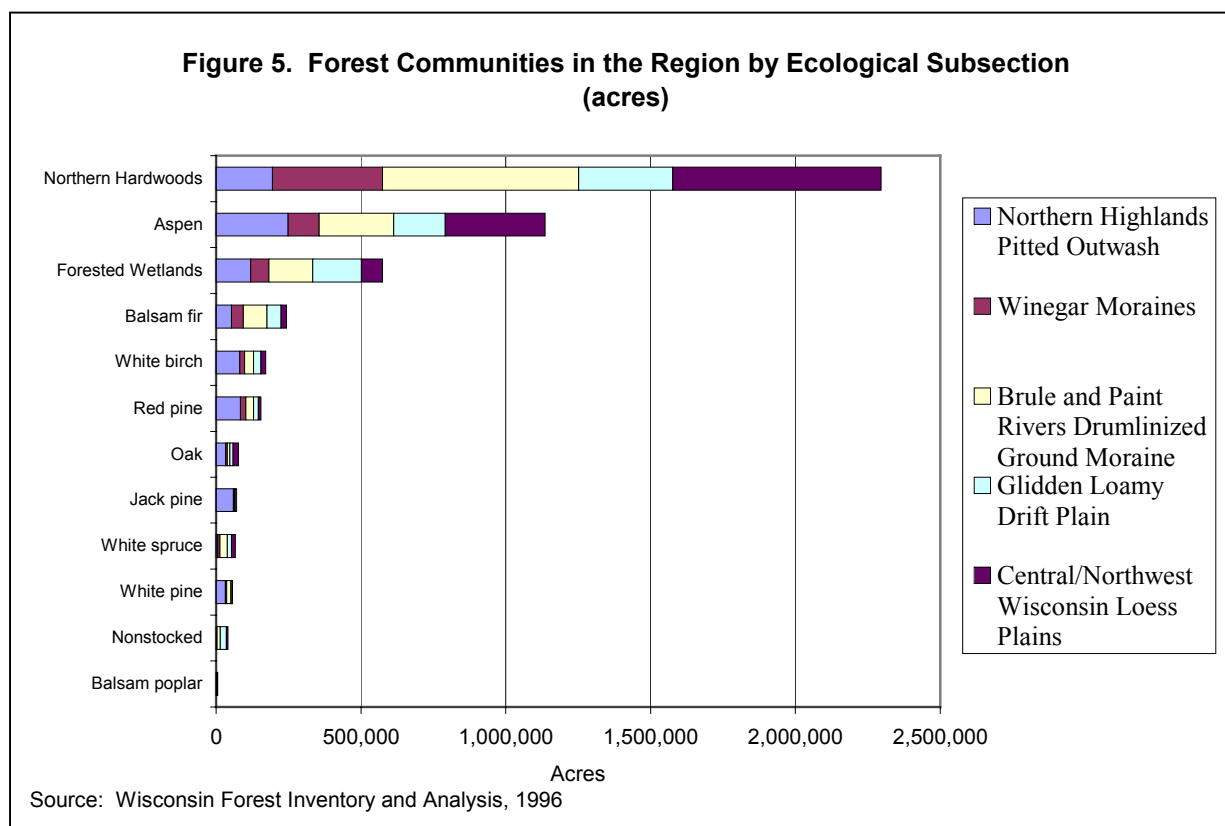
Significant ecological themes are delineated at the level of the section and, more significantly, the subsection. In this analysis, the ecological region for the NHAL is defined by five subsections: the Northern Highland Pitted Outwash, Winegar Moraines, Brule and Paint Rivers Drumlinized Ground Moraine, Glidden Loamy Drift Plain, and Central/Northwest Wisconsin Loess Plains.⁴ (See Map 3: Ecological Subsections in the NHAL Region). Each subsection has specific regionally significant ecological resources and land management capabilities. The Winegar Moraines falls into the Southern Superior Uplands due to its distinct glacial formations. The total area in the five subsections is nearly five million acres.

Another classification system, the Ecological Landscapes developed by the WDNR Ecosystem Management Planning Team, shows the Northern Highland Pitted Outwash as its own ecological landscape, and groups the other four subsections listed above into the North Central Forest landscape. The Ecosystem Management Planning Team grouped these four subsections together due to their similarities compared to the distinctness of the Northern Highland Pitted Outwash. This report focuses on the five subsections as part of the NHFEU classification, but also refers to information from the Ecological Landscapes descriptions.

The NHAL State Forest itself is located primarily in the Northern Highland Pitted Outwash subsection. A small amount of its northwestern edge falls into the Winegar Moraines subsection. The Northern Highland Pitted Outwash includes high densities of kettle lakes, the headwaters for many streams, large open acid peatlands and sedge meadows, forested wetlands, sandy upland soils, and upland forest types such as aspen, white birch, northern hardwoods, red pine, jack pine, red oak, and white pine. All the subsections in the NHAL region except the Pitted Outwash have richer soils and are dominated by northern hardwoods (sugar maple and basswood) and aspen rather than pines and red oak. The Winegar Moraines are characterized by upland moraines with loamy soils and northern hardwood forests, and by large wetlands, including cedar swamps and acidic kettle lakes. The Brule and Paint Rivers Drumlinized Ground Moraine has moraines covered in rich loams and silts, is dominated by northern hardwoods, and has many rivers and streams that drain its linearly shaped wetlands. The Glidden Loamy Drift Plain separates the Northern Highland Pitted Outwash and the Central/Northwest Wisconsin Loess Plains, with sandy loam soils, flat to rolling topography, and northern hardwood and wetland forests. The Central/Northwest Wisconsin Loess Plains is a large, lakeless, mainly flat plain with silt-loam soils that hosts hardwood forests, peatlands, small creeks and rivers, and some farms and pastures.⁵ Each subsection lends itself to a variety of management options, determined by the capability of the site and its significance in a regional context.

⁴ The subsection boundaries have been redefined since the Regional Ecology Assessment was completed in 1999. The new subsections have the following numerical identifiers: Northern Highland Pitted Outwash is Subsection 212Xb; Winegar Moraines is Subsection 212Jc; Brule and Paint Rivers Drumlinized Ground Moraine is Subsection 212Xc; Glidden Loamy Drift Plain is Subsection 212Xa; and Central/Northwest Wisconsin Loess Plains is Subsection 212Xd.

⁵ Albert 1995; NHFEU Subsections on the WDNR ARCVIEW database, 2002.

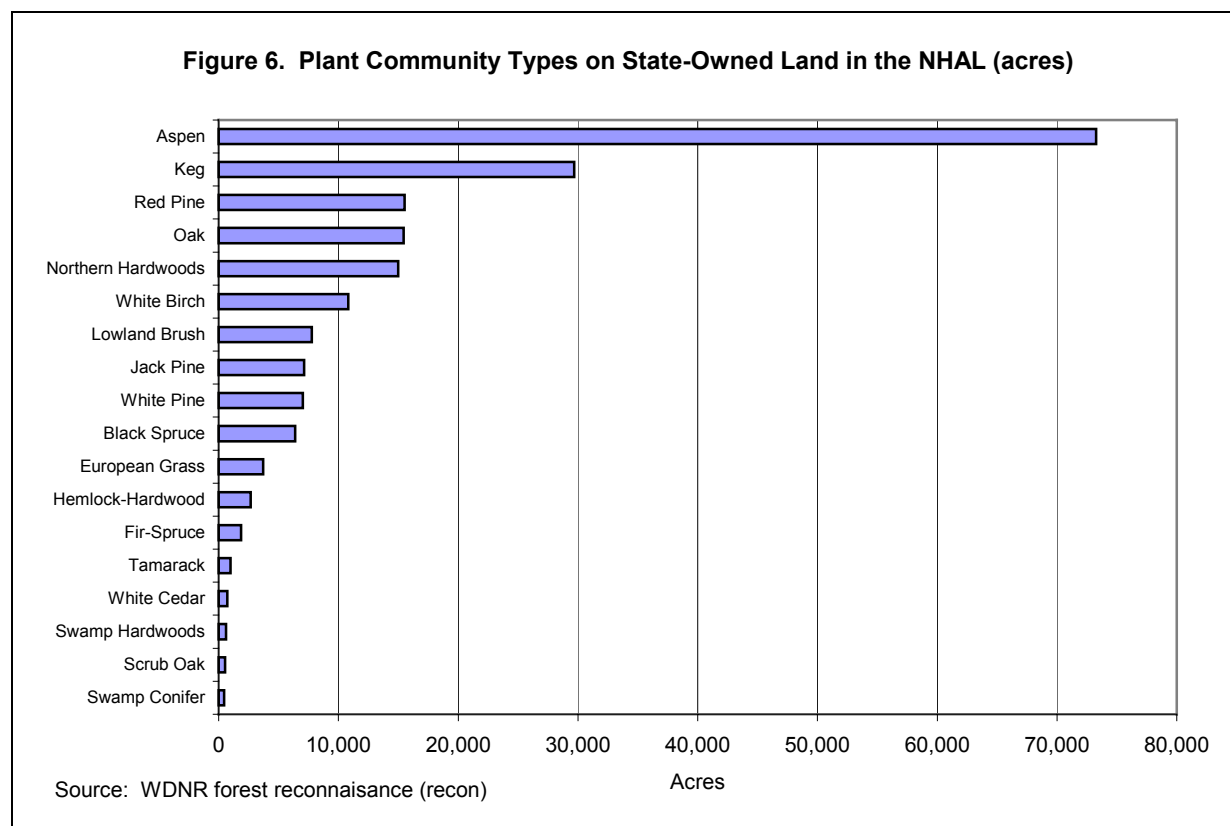


Current Vegetation of the NHAL and Region

The chart above shows the distribution of dominant community types in the region as a whole, divided into ecological subsections. (See Figure 5.) Although only the dominant species is shown, most stands include a mix of tree species. Northern hardwoods are by far the most common forest community type in the region, followed by aspen and forested wetlands (black spruce, tamarack, white cedar, swamp hardwoods, and other swamp conifers). Northern hardwood stands are mainly sugar maple, with some red maple, yellow birch, basswood, and white ash, and with aspen, white birch, red oak, and white pine as secondary species. The Pitted Outwash makes up most of the red and white pine acreage, and is the only subsection with more aspen than northern hardwoods. Figure 5 does not include unforested wetlands (keg and lowland brush) which make up between 6% and 12% of each subsection. A comparison of Forest Inventory and Analysis data from previous decades indicates that forested land is increasing in the region.

The NHAL, like the region, is dominated by young, second-growth forests. As shown above, the NHAL stands out in the region for its sandy soil habitat types, which can support species such as aspen, red, white, and jack pine, white birch, and red oak. Figure 6 shows the abundance of different forest community types on state-owned land in the NHAL State Forest, according to forest recon data.⁶ Community types listed in this chart represent only the dominant species in a stand, but most communities contain a mix of tree species. About 90% of the NHAL falls within the Northern Highland Pitted Outwash, while 10% falls into the Winegar Moraines.

⁶ Recon data may be up to forty years old for some stands.



Uplands occupy 77% of the NHAL and lowlands 23%. Aspen-dominated forests make up 33% of state-owned land, and about 45% of state-owned uplands. The prevalence of aspen is a result of turn-of-the-century logging and fire and forest management practices of the past decades. About 85% of the aspen is less than 40 years old. About 50% of the red and 60% of the jack pine stands are of plantation origin. (J. Olsen, pers. comm.) Most northern hardwood stands are 60 to 80 years old, although some are as old as 140 years. The majority of white pine and hemlock-hardwood stands are much older, from 80 to 120 years for pine and over 120 years for hemlock-hardwoods. (Eckstein et al. 2001) Big Tree Silviculture has promoted larger red and white pine, red oak, maple, and hemlock trees on better quality sites throughout the forest, reducing the amount of aspen and white birch present. In total, forests greater than 100-120 years old occupy 1 to 3% of the NHAL. (Eckstein et al. 2001) Grass exists as widely scattered one-acre forest openings created for wildlife management or of natural origin. Appendix A shows a summary of plant, animal, and community types on the NHAL from the Biotic Inventory.

Northern Highland Pitted Outwash

The Northern Highland Pitted Outwash topography is a rolling landscape with sandy loam soils created by the retreat of the last glacier, with one of the highest concentrations of fresh water lakes in the world. Over 90% of the NHAL State Forest is located in the Northern Highlands Pitted Outwash. (See Map 3.) Wetland resources in the Pitted Outwash include a high density of kettle lakes, the headwaters for many major streams, and large open acid peatlands and sedge meadows. The sandy glacial deposits along with frequent fire, wind, and insect disturbance produced one of the upper Midwest's great presettlement pine forests. These factors encouraged dry forests

dominated by white and red pine, with a mix of aspen, white birch, red oak, and jack pine. Due to the history of land use and to management practices of the past decades, today this forest is dominated mostly by aspen, with northern hardwoods and plantation pine also common. The overall characteristic of the present forest is that of a young forest with small patch sizes where timber harvest replaces fire as the main force shaping forest structure and stand dynamics. (Epstein et al. 2001) At the subsection level there is considerable potential for large-block management since the forests are only moderately fragmented by development and connections might be made with the Chequamegon-Nicolet and Ottawa National Forests. (Bartelt et al. 1999) According to WISCLAND data, the Pitted Outwash is made up of forests (75%), open water (13%), and unforested wetlands (12%).

In the Pitted Outwash, private non-industrial landowners are the largest category of forest owners (42% of all forests), followed by the state (22%), and then by industrial forests (16%). The NHAL is the largest public property in the Pitted Outwash, with 224,000 of the total 1,100,000 acres of land. Other public properties include part of the Turtle-Flambeau and Willow Flowage Scenic Waters Areas, most of Vilas County Forest and some of Oneida County Forest, and Powell Marsh and Thunder Lake Wildlife Areas. The Lac du Flambeau Reservation is also located within the Pitted Outwash. The uplands of the pitted outwash plain have the ecological capability of supporting several dominant forest types—including aspen, northern hardwoods, red and white pine, white birch, jack pine, and red oak—along with forested and unforested wetlands.

Aspen: Aspen is the dominant forest cover type across land ownerships in the Northern Highland Pitted Outwash, making up 27% of all forested land in the subsection. Aspen dominates 33% of the NHAL. Aspen is an early successional species often occurring with white birch. It can occur on a variety of sites, from dry to moist soils. It is particularly common in the Pitted Outwash due to the cutover of the late 1800s, the history of forest management since then, and its ability to grow well in different habitats. Aspen forests are valuable for providing a sustainable level of forest products as well as for their habitat value to forest game species such as ruffed grouse, white-tailed deer and black bear. Aspen saplings provide habitat for golden-winged and chestnut-sided warblers and pygmy shrews on sites that best meet these species needs. In presettlement forests in the Pitted Outwash, aspen was an important upland secondary species, after red and white pine and white birch. Aspen levels are currently much higher than they were in presettlement forests and are declining slowly.

As mentioned above, the three largest landowners are private non-industrial, state, and industrial forests. Management goals for private non-industrial, industrial, and county forests suggest that aspen will continue to be a dominant management goal. Vilas County Forest has about 35% aspen and anticipates a slow reduction in aspen (less than 10% reduction in the next 50 years). (L. Stevens, pers. comm. 2002) Oneida County Forest is about 50% aspen and also anticipates a slight reduction in acres dominated by aspen. (R. Rollman, pers. comm. 2002) Smaller private non-industrial landowners typically dedicate less effort to forest management, so there has been a small shift of aspen to northern hardwoods on these lands.

Northern Hardwoods: Within the Pitted Outwash, 21% of forests are dominated by northern hardwoods, which includes sugar maple, basswood, white ash, yellow birch, and red maple. However, only 7% of the entire NHAL is dominated by northern hardwoods. Common associates in northern hardwood forests include aspen, birch, hemlock, red oak, and white pine. (Eckstein et al. 2001) This forest type is distributed across ownerships, with most of the northern hardwoods in private non-industrial forests, state land other than the NHAL, and private industrial forests. Sugar maple is valued over red maple for forest products. Northern hardwoods are also valued for

closed-canopy forest interior species, including the black-throated blue warbler and four-toed salamander. Forest raptors such as the northern goshawk, red-shouldered hawk, and broad winged hawk also inhabit northern hardwood forests. Northern hardwoods were not significant presettlement species across most of the Pitted Outwash due to the sandy soils and frequent fire disturbance. In the Pitted Outwash, northern hardwoods are as common as aspen on private non-industrial lands (the largest landowner type in the subsection). However, northern hardwoods are second to aspen on state, industrial forest, county, and tribal lands in the Pitted Outwash.

Red and White Pine: Red and white pine dominate 13% of the Pitted Outwash forests (9% is red pine, 4% is white pine). On the NHAL, red pine dominates 7% of state owned land and white pine dominates 3%. Red and white pine are found on sandy to sandy loam soils and require disturbance such as fire or timber harvest for reproduction. They are found across landowners, with management emphasis on red pine in state-owned land, county forests, private industrial forests, and the small amount of the Ottawa National Forest in Michigan that lies within the Pitted Outwash. Private non-industrial landowners have by far the greatest amount of land dominated by white pine. Red pine is more likely to be of plantation origin due to its high forest production value, shade intolerance, and high planting success. White pine is more likely to have natural origins due in part to insect and disease problems in plantations. Red and white pine forests are valued for sustainable forest products, aesthetic qualities, and increasing regional biodiversity. Rare species including northern goshawks and pine siskins live in conifer dominated forests. Other species such as the evening grosbeak, red crossbill, pine warbler, hermit thrush, and porcupine prefer conifer dominated forests to northern hardwoods or aspen. Within the Pitted Outwash, red pine has increased slightly in the past two decades.

Red and white pine were the two dominant presettlement species in the Pitted Outwash, with a mix of white birch and aspen as secondary species. Before European settlement, red and white pines probably grew to be 100-200 years old in a patchwork of forest ages and types created by the complex interactions of fire, wind, insects, drought, and ecological succession on plant communities growing on a specific site.⁷ In the cutover, natural stands of red and white pine were nearly totally removed. Many areas were planted with red pine by the CCC in the late 1930s and early 1940s. Successful fire suppression since the 1950s has limited the natural regeneration of these disturbance-dependent species.

This forest type is highlighted in the Regional Ecology Assessment for its regional significance, in the CROG assessment as the most extensive community restoration opportunity⁸ on the NHAL and for old growth opportunities, and in the Biotic Inventory for protection or enhancement of existing stands and the potential for landscape level management. The CROG Assessment indicates that red and white pine regeneration will require a variety of adaptive active management techniques including timber harvest, prescribed burning, scarification, and planting.

⁷ Land surveyor notes from the 1860s confirmed that very sandy, flat areas were susceptible to more frequent canopy fires and had smaller trees, jack pines, and barrens. The rolling pitted outwash (the dominant landform on the NHAL) had less frequent canopy fires and was forested with nearly equal amounts of red and white pine along with many aspen and white birch trees. The east sides of lakes and wetlands often times had the largest trees. Protected sites with slightly better sandy loam soils and only occasional canopy fires had white pine and white birch but also yellow birch and sugar maple along with scattered stands of eastern hemlock. (Eckstein et al. 2001)

⁸ Community restoration recognizes that communities, species, structural features, microhabitats, and natural processes that are now diminished or absent from the present landscape have a valuable role to play in maintaining native ecosystems. (Epstein, 1999) Under some definitions, community restoration means moving the current composition and structure of a plant community to a composition and structure that more closely resembles that of the presettlement vegetation. (Eckstein 2001)

The Pitted Outwash offers the best opportunity for dry forest types in the region. Within the Pitted Outwash, several landowners are managing for small increases in red and white pine forests. Vilas County Forest is managing to increase the white pine component of aspen stands, with a slight reduction in aspen over the next 50 years. The Lac du Flambeau reservation has a management goal of increasing pine stands from 3900 acres to 6100 acres over the next 100 years, to achieve aesthetic and economic goals. (Lac du Flambeau 1991) The NHAL, the largest public landowner in the Pitted Outwash, has also managed for a small increase in the red and white pine components of aspen stands. The upland forests of the Northern Highlands Pitted Outwash in the NHAL present the best opportunity on public land in the region for a extensive long-term restoration of a forest dominated by red and white pine with a mix of other species in a matrix of old growth, middle-aged, and young forests.

White Birch: White birch is an early successional species that dominates 9% of the Pitted Outwash forests and 5% of the NHAL. White birch is often found with aspen and red maple. It is more common on private non-industrial forests and state owned land. White birch is valued for its aesthetic character and for providing sustainable forest products and wildlife habitat. In the red and white pine dominated presettlement forest, white birch was the most important secondary species, followed by aspen. Currently, it is declining across land ownerships due to old age, drought, and insect infestations. Because white birch is adapted to disturbances and is shade intolerant, regeneration requires timber harvest, fire and/or scarification of the seedbed.

Jack Pine: Found in dry, sandy soils and adapted to very frequent fires, jack pine is currently dominant on 6.5% of the Pitted Outwash forests and 3.5% of the NHAL. Jack pine may be found along with scrub oak. Jack pine is twice as common as red pine in private non-industrial forests, equally as abundant as red pine in county forests, and less than half as abundant on state owned land, industrial forests, and national forests. Jack pine is a fast-growing species valued for sustainable forest products and habitat for many species. Rare species dependent on jack pine includes the connecticut warbler. Birds such as pine siskins, evening grosbeaks, red crossbills, pine warblers and sharp-shinned hawks that inhabit red and white pine forests also favor jack pine forests, depending on the forest structure. Spruce grouse can be found in older jack pine stands. In presettlement forests, jack pine was uncommon in most of the NHAL area, but somewhat more abundant in the northwest part of the Pitted Outwash. Large areas of jack pine were established by CCC crews in the 1930s and 1940s. This period was followed by fire suppression which limited the regeneration of jack pine stands. Jack pine stands are declining and have been widely salvaged recently, due to insect infestations and old age. Restoration opportunities for jack pine on appropriate sites were identified in the CROG Assessment. Regeneration of jack pine faces many challenges but can be achieved by planting, prescribed burning, or cutting and scarifying the soil to mimic some effects of fire.

Red Oak: Red oak is dominant on about 4% of the Pitted Outwash and 7% of the NHAL. Red oak is typically a component of disturbance dependent forests on sandy-loam soils. It is found mainly on private non-industrial forests, followed by state land, county forests, industrial forests, and tribal land. Red oak forests are valued for wildlife habitat because acorns are a food source, and for forest products. Red oak existed in presettlement forests as a uncommon secondary species. Red oak is shade intolerant and regeneration requires active management such as timber harvest, soil scarification, or prescribed burning. Deer browsing limits the regeneration of red oak.

Forested Wetlands: About 13% of the Pitted Outwash forest is forested wetlands including, in order of significance, black spruce, tamarack, northern white cedar, and swamp hardwoods. Only about 5% of the NHAL's forests are forested wetlands, and many of these are older (60-100 years)

black spruce stands. Wetlands represent the vital transition between the dry habitats of the uplands and the surface waters of lakes and streams. Forested wetlands are widespread on private non-industrial forest, state owned land, industrial forest, and county forest. Some forested wetlands are harvested when frozen ground conditions are present. Forested wetlands have considerable value for a range of wildlife species such as neotropical migrants, rare species such as Yellow-Bellied Flycatchers, forest products, and watershed protection. Forested wetlands have slow succession, little harvest, and low potential for the land to support other types of forests. In presettlement forested wetlands, tamarack was by far the leading dominant with black spruce as a common associate. The peatlands were cut at the turn of the century and have regenerated naturally, with a slow increase in tamarack in open areas. Over time there has been a shift from tamarack to later-successional black spruce. Restoration of tamarack is one of the community restoration opportunities identified in the CROG Assessment and Biotic Inventory. According to the CROG Assessment, if restoration of tamarack is desired, then the best opportunity is to allow natural succession to occur.⁹ However, without disturbance the long-term succession will be to a black spruce dominated forest.

The northern white cedar forests are represented on the NHAL in two exceptional, large, and diverse occurrences. The northern hardwood swamp (black ash) has one large occurrence and is naturally rare in Wisconsin. (Epstein et al. 1999)

Unforested Wetlands: About 12% of the total area in the Pitted Outwash is unforested wetlands. Most of the unforested wetlands are areas of open sphagnum moss, while some are lowland brush (ie. alder thickets or wet meadows). About 17% of the NHAL is unforested wetlands. These community types support many rare species and are valued for watershed protection. Unforested wetlands are typically stable, though some are succeeding to tamarack and black spruce. Management such as prescribed burning and mechanical shearing in unforested wetlands maintains the open habitat, though most unforested wetlands are unmanaged. According to the Regional Ecology Assessment, wetland habitats most in need of management attention are lakes, sedge meadows, and bogs.

The NHAL offers the opportunity to protect wetland communities that are rare or representative in the region, or that are common and in need of protection from drainage and development. Seventy-nine percent of the rare plants documented on the NHAL grow primarily in wet habitats, illustrating the biodiversity significance of abundant high-quality lakes, streams, and wetlands in the region. The NHAL hosts many of Wisconsin's largest known populations of shore sedge, marsh willow-herb, and leafy white orchis. Rare bryophytes (mosses, liverworts) and lichens are also found on the NHAL, the majority of them in wetland habitats. The high number of rare aquatic animals is also a reflection of the abundance of high-quality lakes, streams, and wetlands on the property. A suite of butterfly species including the bog copper is associated with peatlands. The yellow rail is one rare bird that lives in the unforested wetlands of the Pitted Outwash.

Extensive acreages of good quality acid peatlands on the NHAL offer an opportunity for increased protection, as all of the larger sites have been somewhat altered or compromised by various developments. The boreal fen is rare on the NHAL and apparently uncommon throughout Wisconsin, but several excellent stands with unusually rich repositories of rare plants were identified. The northern sedge meadow is widespread in the region with several large high quality occurrences along streams and lakeshores in the NHAL. (Epstein et al. 1999) Protection of

⁹ Eckstein et al. 2001.

existing forested and unforested wetlands in good condition across the subsection is critical to the maintenance of high water quality and sufficient water quantity.

The shrub-carr (willow and dogwood shrub swamp) and alder thicket types are common throughout Wisconsin and typically occur on the NHAL as inclusions in other types of wetlands.

Lakes and Streams: The density of kettle lakes in the Pitted Outwash, formed by receding glaciers, is among the highest in the world. The area also forms the headwaters for the Wisconsin and Flambeau-Chippewa drainage basins. Aquatic ecosystem protection is one of the highest conservation priorities in this region,¹⁰ and excellent opportunities exist on the NHAL. Lakes and streams cover 12% of the surface of the NHAL. The NHAL is fast becoming one of the last places in the region with large undeveloped lakes. The lakes and streams in the NHAL are treasured for their high water quality and provide a variety of habitats, supporting diverse fish, amphibian, invertebrate, and plant communities, with many rare species. The majority of rare plants and animals on the NHAL were identified in wet habitats. The NHAL holds the state's largest known populations and large portions of the total number of populations of many aquatic plants. The NHAL contributes to one of the highest known regional concentrations of bald eagle, osprey, and common loon, which depend on open lakes and rivers. (See Map 4: Statewide Eagle and Osprey Nest Distribution.)

According to the Biotic Inventory for the NHAL (Epstein et al. 1999), the NHAL presents exceptional opportunities to protect and manage a diverse array of aquatic features including seepage lakes, drainage lakes, spring lakes, spring ponds, small streams, and selected stretches of larger streams such as the Manitowish and Wisconsin Rivers.

Soft-water seepage lakes are particularly diverse and well represented on the NHAL. A special feature of the Northern Highland Pitted Outwash is the concentration of *very* soft seepage lakes. These lakes feature a unique aquatic community characterized by a number of aquatic plants that exhibit a sterile rosette growth form carpeting the lake bottom. A number of rare invertebrates are found in these lakes as well. Large firm bottomed lakes are common on the forest. The NHAL offers perhaps the only opportunity to continue to protect these large lakes - a type facing especially strong development pressure in northern Wisconsin.

In addition to aquatic features, wild rice marshes were identified by both the Biotic Inventory (Epstein et al. 1999) and CROG (Eckstein 2001) as having a high opportunity for conservation. Emergent aquatic, submergent aquatic, and inland beach communities are widespread in northern Wisconsin, and have excellent occurrences on the NHAL.

On the Lac du Flambeau Reservation, several small seepage lakes are designated as undeveloped with a no-management buffer. The Bear River, which runs into the NHAL, is in a protected corridor.

Landscape Level Management Opportunities: Several assessments, including the Biodiversity, CROG, and Regional Ecology Assessments along with the Biotic Inventory identify landscape level management as a significant opportunity on the NHAL. Management decisions have traditionally been made at the stand or compartment level. Landscape level ecosystem management, however, addresses a broader scale, encouraging decisions that take into account a site's regional ecological

¹⁰ Biotic Inventory

context. Increasing stand size, coordinating with nearby landowners, and using a landscape level approach in the development of the master plan are opportunities identified in the Biodiversity Assessment. The Biotic Inventory mapped a 28,000 acre Central Highlands macrosite that could provide landscape-level management opportunities for pine and hardwood forests. This corridor was considered one of the best opportunities on state lands for large scale ecosystem management. Options for management on state owned lands within the macrosite include enhancement of present conditions by increasing forest block size, increasing stand age to achieve a diversity of species and ages and, where appropriate and feasible, increasing the coniferous component of the existing stands. The Biotic Inventory identified three other macrosites: the Lower Manitowish River, Star Lake Crescent, and Northeast Springs-Johnson Creek. (See Map 5: Northern Highland-American Legion State Forest Primary Sites (1992-96).)

Winegar Moraines

The Winegar Moraines extend from northern Wisconsin into the Upper Peninsula of Michigan. (See Map 3.) A small portion of the NHAL State Forest is located in the Winegar Moraines. It is the smallest of the five subsections in the NHAL region. The upland forests in this subsection are dominated by sandy loams and silty loams and, historically, had very infrequent canopy fires.¹¹ These factors encouraged a wet (mesic) forest dominated by eastern hemlock, sugar maple, yellow birch, and other northern hardwoods. The Winegar Moraines also contains a relatively large number of wetlands, including forested, shrub, and herbaceous wetlands, as well as bogs, acidic kettle lakes, and cedar swamps. The cedar swamps function as deer wintering yards. In high density lake areas, the shoreline is highly developed with second homes. Intensive forest management has divided uplands in the Winegar Moraines into forests of different ages. However, the potential to manage for forest interior species occurs here because most land remains in forests. Connections might be made in the Winegar Moraines between the NHAL and the Ottawa National Forest. Throughout the Winegar Moraines, upland habitats most at risk or in need of management attention are mature upland deciduous forests and shrub habitats. Rare species in this subsection include the Canada warbler and Arctic shrew in closed lowland conifers, black-throated blue warbler and four-toed salamander in mature upland deciduous forest, the northern goshawk in mature upland mixed forests, the star-nosed mole in open lowland conifers, and the golden-winged warbler and pygmy shrew in shrub swamps.¹² According to the Regional Ecology Assessment, wetland habitats most in need of management attention are marshes, mature lowland deciduous forests, closed lowland conifers, and shrub habitats in the Winegar Moraines.

Almost half the forests in the Winegar Moraines are located within Michigan's Ottawa National Forest (46%), while smaller portions of forest are in private non-industrial land (24%), county forests including Wisconsin's Iron County Forest and Michigan's Gogebic County Forest (15%), industrial forests (13%), and a very small amount of state-owned land (2%). Wisconsin's Winegar Moraine is made up of forests (83%), unforested wetlands (8%), and open water (6%). The Winegar Moraine has the ecological capability to support three main types of upland forests—northern hardwoods, aspen, and hemlock-hardwoods—in addition to forested wetlands.

¹¹ Eckstein et al. 2001.

¹² Bartelt et al. 1999.

Northern Hardwoods: About 60% of the Winegar Moraines is dominated by northern hardwoods such as sugar maple, yellow birch, basswood, white ash and red maple. Northern hardwoods thrive on the loamy soils of the moraines. Northern hardwoods are distributed across landowners. Over half of Ottawa National Forest, private non-industrial and industrial forests, and county forests are dominated by northern hardwoods. Northern hardwood forests are valued for forest products and forest-interior species. In presettlement forests sugar maple was common but much less prevalent than eastern hemlock and yellow birch. Uneven-aged management for northern hardwoods is the main management objective for the Ottawa National Forest. Given the management objectives of the national forest and private non-industrial landowners, northern hardwoods are likely to remain dominant in the Winegar Moraines.

Aspen: Aspen makes up 17% of the forested land in the Winegar Moraine (paper birch makes up another 2%). These early successional species are common across landowners. Aspen dominates a larger portion of the private non-industrial forest than of the national forest. It is valued for forest products and wildlife habitat. Aspen was relatively uncommon in presettlement hemlock-hardwood forests. On the Ottawa National Forest, some areas of the Winegar Moraine are managed for early successional species such as aspen. Aspen has declined slightly in the past two decades. (Forest Inventory and Analysis 1996)

Hemlock-Hardwoods: The eastern hemlock, yellow birch, and sugar maple forest community is extremely diminished in the Winegar Moraines, and throughout its entire range in Wisconsin. Most existing hemlock-hardwood stands are small and scattered. This forest type is valued for forest-interior species and its aesthetic qualities. Hemlock-hardwoods was the dominant presettlement community, and hemlock was by far the most common species. On the Ottawa National Forest, eastern hemlock is found scattered throughout many northern hardwood stands. The Ottawa National Forest is managing to perpetuate or preserve hemlock at the site level where appropriate. Although the state is the smallest landowner in the Winegar Moraine, it does offer an opportunity to restore hemlock-hardwoods on appropriate sites. (Eckstein et al. 2001) Hemlock-hardwood abundance is currently stable. Regeneration of hemlock is a significant management challenge, due to lack of seed sources, high browse pressure, and the lack of fire disturbance.

Forested Wetlands: About 10% of the Winegar Moraines forest is forested wetlands including, in order of significance, northern white cedar, black spruce, tamarack, and swamp hardwoods. Forested wetlands are widespread on private non-industrial forest, national forest, industrial forest, and county forest. Acidic kettle lakes and cedar swamps are more common here than in the Pitted Outwash. Many cedar swamps serve as deer wintering yards. Forested wetlands have considerable value for rare species, watershed protection, and forest products.

Brule and Paint Rivers Drumlinized Ground Moraine

This ecological area is characterized by rolling moraines capped with silt and loam soil, long drumlins, linearly shaped swamps and lakes, and northern hardwood forests. It is the largest subsection in the NHAL region, located east of the NHAL in both Michigan and Wisconsin. (See Map 3.) The Brule River, which forms the border between Wisconsin and Michigan, and other rivers drain the area's wetlands. Its presettlement forests were dominated by hemlock and northern hardwoods, with more american elm, ash, and yellow birch than other subsections in the region. Disturbance occurred mainly through windthrow, while fire was uncommon. The soil is a richer loam in Wisconsin than in Michigan side. Within the Wisconsin portion of the Brule and Paint

Rivers Drumlinized Ground Moraine, forests make up 84% of the area, while unforested wetlands are 6%, and open water is 3%.

The Nicolet Unit of the Chequamegon-Nicolet National Forest and the Ottawa National Forest are by far the largest landowners, with 46% of the subsection's forests. Private non-industrial forest owners are the second largest forest owner (29% of forest), followed by industrial forests (16%), and then by county forests (Forest County) (7%). A minimal amount of state land falls into this subsection.

The Brule and Paint Rivers Drumlinized Ground Moraine has the ecological capability to support four main types of upland forest: northern hardwoods, aspen, spruce-fir, and hemlock hardwoods, along with forested wetlands in the lowland areas.

Northern Hardwoods: The silt loam soils of this area produce a northern hardwood forest that dominates 52% of the total forest. Sugar maple is the dominant species. The hardwoods are valued for their high quality forest products and their closed canopy interior species. Presettlement forests had a mix of hemlock, sugar maple, ash, american elm and yellow birch with disturbance mainly from wind. Given general management objectives for the national forest and private non-industrial owners (the two largest landowner types) much of the forest is likely to remain in northern hardwoods.

Aspen: About 20% of the forest is dominated by aspen, an early successional species. National forest, private non-industrial forests, and county forests have the largest amounts of aspen forests. County forests have more aspen than northern hardwoods due to their management goals. Aspen forests provide forest products and habitat for many game species. It was an insignificant presettlement species. Aspen is declining slowly due to succession.

Spruce-fir: About 8% of the forest is dominated by balsam fir and white spruce, the two trees that make up the boreal spruce-fir forest. This forest type is found mainly in the national forest, and to some extent in the private non-industrial forest. Balsam fir is also found on industrial forest lands. This forest type is valued for forest products and for conifer-dependent species.

Hemlock-hardwoods: This dominant presettlement community type—a mix of hemlock, sugar maple, yellow birch, white pine, ash, and american elm—is now very diminished in this ecological area, as it is across northern Wisconsin. Hemlock regeneration poses many challenges. Given the dominance of national forest in this ecological area, some land is managed to maintain or restore hemlock-hardwood forests.

Forested Wetlands: Forested wetlands, made up mainly of black spruce, northern white cedar, and some tamarack, dominate about 12% of this area. It is mainly found in the national forest, private non-industrial forest, and industrial forest. Forested wetlands provide habitat for a variety of species, watershed protection, and forest products.

Glidden Loamy Drift Plain

The Glidden Loamy Drift Plain separates the Pitted Outwash from the Central Wisconsin Loess Plains. (See Map 3.) It has variable terrain, well drained sandy loam soil, northern hardwood forests, and considerable forested and unforested wetlands. The Chequamegon Unit of the Chequamegon-Nicolet National Forest is the largest landowner in the area, followed closely by

private non-industrial forest owners. County forests are a distant third, followed by industrial forests and state land. Within the Glidden Loamy Drift Plain, forests make up 75% of the area, while unforested wetlands are 12%, open water is 6%, and pasture/croplands are 6%. The Glidden Loamy Drift Plain has the ecological capability of supporting three main upland forest types—northern hardwoods, aspen, and hemlock-hardwoods—along with forested and unforested wetlands.

Northern Hardwoods: Within the Glidden Loamy Drift Plain, northern hardwoods dominate 40% of all forests. The national forest and private non-industrial forests are the dominant forest owners. Given their general management objectives, forest is likely to remain in northern hardwoods.

Aspen: Aspen makes up 22% of forests, with most of the aspen found in the national forest and private non-industrial forest, and some in industrial and county forests. Aspen is valued for forest production and as habitat for game species. It was an insignificant presettlement species in most areas. In the past decade, the number of acres dominated by aspen remained stable.

Hemlock-hardwoods: This dominant presettlement community type—a mix of hemlock, sugar maple, yellow birch, white pine, ash, and american elm—is now very diminished in this ecological area, as it is across northern Wisconsin. Hemlock regeneration poses many challenges. Given the dominance of national forest in this ecological area, some land may be managed to restore hemlock-hardwood forests.

Forested Wetlands: A combination of black spruce, northern white cedar, and tamarack dominate 21% of the forests in the area. Wetlands are common due to the collapsed outwash landscape. Tamarack is especially prevalent in the private non-industrial forest.

Unforested Wetlands: Unforested wetlands dominate 12% of the total area. They are valued for species diversity and watershed protection.

Central Wisconsin Loess Plains

The Central Wisconsin Loess Plains is a mostly flat plain with moderately well-drained silt loam soil. It is located south and east of the Glidden Loamy Drift Plain. (See Map 3.) Peatlands and lowlands are abundant, while lakes are uncommon. Presettlement forests in this area were almost totally dominated by hemlock, sugar maple, and yellow birch, with some pine in places and swamp conifers in the lowlands. Currently, half of all forested land is in private non-industrial ownership. County forests are a distant second (18% of forests), followed by industrial forests (14%), the Chequamegon Unit of the Chequamegon-Nicolet National Forest (10%), state land including the Flambeau River State Forest (7%), and finally Native American lands (2%). The total acreage in the Loess Plains is made up of forests (65-70%), pastureland/grassland (16%), unforested wetlands (14%), and open water (2%). The major land uses and forest types within the ecological capabilities for this area are northern hardwoods, aspen, and hemlock-hardwood forests, cropland/pasture, and unforested wetlands.

Northern Hardwoods: Northern hardwoods dominate in the Central Wisconsin Loess Plains, making up 60% of the forests. The northern hardwoods are found predominately in private non-industrial land, along with forest industry, county forest, national forest, and some state and Native American lands. Due to the productivity of the Loess Plains, northern hardwoods are grown here on short, intensive rotations.

Aspen: Aspen makes up 30% of all forests in the Loess Plains. Aspen is fairly common across landowners. County forests have a greater percentage of their land in aspen than any other forest owner. Aspen is valued for forest production and as habitat for game species. It was an insignificant presettlement species. Aspen is declining slowly due to succession.

Hemlock-hardwoods: This community type—a mix of hemlock, sugar maple, yellow birch, white pine, ash, and american elm—was very common in presettlement forests but is now quite diminished in this ecological area, as it is across northern Wisconsin. Hemlock regeneration poses many challenges.

Pasture/Cropland: This land use category makes up 16% of the total area in the Loess Plains. It is entirely privately owned. Sites with richer soils are more likely to be used in dairy farming and some crops, while sandy soils are more likely to be pastureland. Despite the loamy soil, agriculture is restricted in many areas due to poor drainage, rocky soil, and small steep upland features.

Unforested Wetlands: Unforested wetlands dominate 14% of the total area in the Loess Plains. They are mainly flat, open peatlands, and are valued for species diversity and watershed protection.

MANAGEMENT CHALLENGES AND LIMITATIONS

The biggest land management challenge facing the NHAL is balancing a variety of ecological, economic, and social needs in the practice of sustainable forestry. While this section has focused on the ecological capabilities of the land in a regional context, other factors will be important as well in deciding the land management objectives for the NHAL.

One land management challenge facing the NHAL is restoration of forest species and communities, a slow and uncertain process. It is particularly difficult because the composition and structure of vegetation in the Northern Highland Pitted Outwash was once formed by periodic and sometimes catastrophic fire that is now suppressed. Red, white, and jack pine, white birch, and red oak often require active management to regenerate, potentially including clearcutting, planting, scarification, herbicide use, and prescribed fire. An additional management challenge is heavy browsing by deer that limits the regeneration of hemlock, white pine, red oak, white birch, and other species. A wide variety of environmental and ecological factors prevent the restoration of eastern hemlock. Restoration of this species could be achieved through underplanting, scarification, and timber harvesting.

Many of the high quality habitats used by rare plants at the NHAL—particularly wetland communities—may be vulnerable to invasion by aggressive exotic species such as purple loosestrife, reed canary grass, Eurasian water milfoil, and glossy buckthorn. Preventing the spread of these species would greatly aid the survival of rare aquatic and wetland species at the NHAL.

A variety of insects and diseases impact the forests of the NHAL. Spittlebug and budworm populations are monitored and managed in pine plantations on the NHAL. Forest tent caterpillars are invading aspen, birch, and oak stands. The gypsy moth has spread into Wisconsin but has not yet reached the NHAL. It is monitored through a federal program. Diseases, insects, and fungi are natural parts of forest ecosystems, but at epidemic levels, they may impact forest management objectives on the NHAL. (Guthmiller et al. 1998)

The NHAL has the opportunity to work with county, national, tribal, and private industrial and non-industrial landowners to promote landscape-level ecosystem management. The prevalence of private in-holdings within the NHAL boundary presents an additional opportunity for cooperation and outreach to landowners.

The NHAL has limited acreage for restoration of hemlock-hardwood forests and protection of undeveloped lakes within the Winegar Moraines. Currently, the NHAL does not directly link with Michigan's Ottawa National Forest, making landscape level connections and protected corridors difficult to achieve in the Winegar Moraines.

FINDINGS

By providing a general assessment of the ecological resources in the large region around the NHAL and recognizing the regional ecological capabilities and current land uses, the significance of unique state forest resources can be defined. Potential ecological management opportunities for the state forests can be identified that are consistent with and beneficial to the overall regional ecology. (Bartelt et al. 1999) Sustainable forestry provides ecological, economic, social, and cultural benefits for present and future generations.

The NHAL Ecological Region is defined by five ecological subsections. Four of these subsections can support northern hardwood, hemlock-hardwood, or aspen dominated forests in the uplands, due to their predominately loamy soils.

In contrast, the Northern Highland Pitted Outwash subsection is dominated by sandy and sandy-loam upland soils and disturbance-dependent forest types. The NHAL lies mostly within the Pitted Outwash, and is the largest public property in the subsection. The drier upland habitats of the Pitted Outwash have the ecological capability of supporting red, white, and jack pine, aspen, white birch, and red oak, along with northern hardwoods on richer sites. Several of these objectives, such as managing predominately for short lived species such as aspen and white birch, are accomplished on other lands within the region. Much of this land is open to public hunting. (See Recreation, page 36.) Some other landowners, such as Vilas County Forest and the Lac du Flambeau Reservation, are managing to increase the conifer component or to convert small areas to pine. The NHAL represents the best opportunity in the region to restore large areas of red and white pine-dominated forest while maintaining a mix of aspen, white birch, red oak, and jack pine. The NHAL uplands also offer opportunities to manage some areas for old growth characteristics and protect diverse communities of plants and animals.

A small piece of the NHAL falls into the Winegar Moraine, the ecological subsection just north of the Pitted Outwash. The rich loamy upland soils of this subsection have the ecological capability of supporting northern hardwoods, hemlock-hardwoods, and aspen. The lack of land and connections to other major landowners in the Winegar Moraine limits the ability of the NHAL to play a major role in landscape level ecosystem management within this area. However, the NHAL does have an opportunity to manage for northern hardwoods and hemlock restoration on appropriate sites within the Winegar Moraine.

The forested and unforested wetlands and aquatic habitats of the NHAL represent highly significant opportunities for protection and management of rare and biologically diverse communities, restoration of presettlement wetland vegetation, and maintenance of wetland communities on the landscape level. The high density of lakes, and the abundance of undeveloped lakes, is unique to

the NHAL State Forest within the region. Many areas around the NHAL are rapidly developing, with more homes and businesses and less undeveloped shoreline. The NHAL's combination of large size and central location in the Northern Highland Pitted Outwash set the stage for the property to play a defining role in the management and protection of natural communities that rate as the best that the region and state have to offer.

RECREATION ROLES, RESOURCES, TRENDS, AND ISSUES

Central northern Wisconsin is one of the most popular outdoor recreation areas in Wisconsin. People from across the state and the upper Midwest come to the region to enjoy a wide diversity of recreational pursuits year-round. Boating, fishing, hunting, hiking, camping, cross-country skiing and snowmobiling are just some of the activities enjoyed by visitors to the region's many lakes and vast forests. These recreational activities can have a variety of social, economic, and ecological implications. The region surrounding the Northern Highland-American Legion State Forest contains county forests, a national forest, state land, some tribal land, and some private land open to public recreation. Depending upon the goals, facilities, and land capabilities of the landowner, recreational opportunities will vary substantially. In this analysis of recreational opportunities, the NHAL region includes Forest, Iron, Lincoln, Oneida, Price, and Vilas Counties and the Chequamegon-Nicolet National Forest, which flanks the NHAL on the east and west¹³.

The 225,000 acre Northern Highland-American Legion State Forest plays an important role in providing outdoor recreational opportunities in this region. The NHAL is dotted with hundreds of beautiful, undeveloped lakes and provides a wide variety of recreation. The NHAL is centrally located in northern Wisconsin close to the tourist communities of Minocqua, Woodruff, Rhinelander, and Eagle River. It is the largest and most visited state property with more than two million recorded visitors annually from across Wisconsin, as well as from Illinois, Iowa, Minnesota and other states. Recreating on the NHAL is a regular part of the culture and lifestyle of many local residents in Vilas, Oneida, and Iron Counties. Visitation has been increasing steadily over the past decade. For some people the NHAL is a vacation destination or a place to get together with family and friends. Many visitors talk about the generations of their family that have been coming, and may continue to come, to the NHAL. For these people, the NHAL is a part of their lives, and they feel a deep, personal sense of ownership toward their favorite campgrounds, lakes or trails.

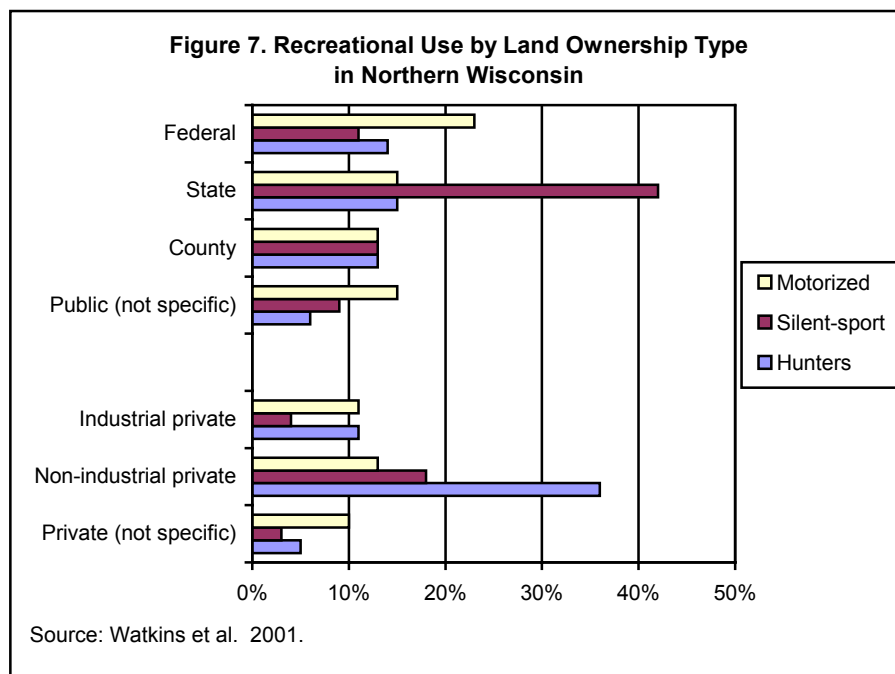
Regional studies show that numbers of recreational users are increasing,¹⁴ while the amount of land open to public recreation is decreasing somewhat. While recreational use fluctuates due to weather, the economy, and other factors, recreation is generally increasing. Spring and fall shoulder seasons are becoming more popular. These trends, along with diverse preferences among recreators for different outdoor experiences, have led to increased pressure on the state forests and user conflict on public land. Increasingly, recreational providers will need to work together—each providing that part of the recreational pie that they can best provide—in order to meet the wide and ever-growing outdoor recreation demands in central northern Wisconsin.

¹³ The Flambeau River State Forest, which lies partly within Price County, is not included in the regional recreation assessment for the NHAL.

¹⁴ WDNR, 1998.

RECREATIONAL ROLES OF DIFFERENT LANDOWNERS

Public outdoor recreation in central northern Wisconsin is provided by a mix of federal, state, county, tribal, and private landowners. The Recreational Supply and Demand Assessment (WDNR 2001) identified three major types of forest-based recreators which tend to utilize different types of properties in search of different recreational experiences. These are silent-sport (e.g. hikers, bird watchers, cross-country skiers), hunters, and motorized recreators. Figure 7 below shows people's primary recreational activity by land ownership type.



National forests

The Chequamegon-Nicolet National Forest (CNNF) has the largest blocks of public land in the region. National forests have a broad multiple use purpose and offer lightly to moderately developed recreation facilities. National forests tend to attract people seeking more remote experiences, offering undesignated camping throughout the forest. The Chequamegon Unit of the CNNF is also a major provider of motorized recreation, providing designated snowmobile and ATV trails and the opportunity to ride ATVs off-trail in many areas.

State Forests and Other State Land

State land in this region includes the Northern Highland-American Legion State Forest, Powell Marsh Wildlife Area, Bearskin-Hiawatha State Trail, Turtle-Flambeau Scenic Waters Area, Willow Flowage Scenic Waters Area, and Council Grounds State Park. State forests are smaller than national forests, but share their multiple use purpose. Recreators generally consider state forests to be less remote and somewhat more developed than national forests, but less developed than state parks. State forests are considered a primary provider of silent-sport recreational opportunities. (See Figure 7). State forests tend toward a rustic camping experience. Other state lands have more focused purposes, such as intensive recreation with more developed facilities in state parks, scenic

boating and fishing opportunities in scenic waters areas, and hunting and wildlife viewing opportunities in wildlife areas.

County Forests

Forest, Iron, Lincoln, Oneida, Price, and Vilas County Forests are all located within the NHAL region. County forests also have multiple use purposes. These highly utilized forests attract large numbers of hunters, provide a variety of trails, contribute significant snowmobile and ATV riding opportunities and have, overall, a low emphasis on camping.

Tribal Land

The Lac du Flambeau Reservation, located adjacent to the NHAL in Vilas County, provides public fishing, boating, and snowmobiling opportunities and designated public campgrounds. The reservation includes a high density of lakes. The tribe has a goal of maintaining and improving recreational facilities, highlighting cultural and historical activities, educating the public on Indian culture, and pursuing the development of additional tourism activities. (Lac du Flambeau Webpage) Tribal land is not open to non-tribal members for hunting or trapping.

Private Land

Recreation opportunities on private land are provided by clubs, non-profit organizations, commercial operators, and owners of both industrial and non-industrial private forests. Some private industrial and non-industrial forests are open to public recreation such as hunting, hiking, and berry-picking through their enrollment in Managed Forest Law or Forest Crop Law programs. Commercial facilities provide a high level of facilities and services on small land bases, with services such as RV campgrounds, resorts, golf courses, and cross-country and downhill ski areas. Private recreational land, closed to public access, is becoming more popular, as a recent boom in land purchasing has provided more owners and their families and friends small parcels of recreational land.

RECREATIONAL RESOURCES, TRENDS, AND ISSUES

This section provides an inventory of water-based, camping, designated trail and off-trail, hunting and wild resource opportunities in the region and on the NHAL. Based on these data, the recreational role or niche of the NHAL within the region is defined. Because the miles of trails and numbers of campsites change frequently, the figures in this report are approximate.

Water-based Recreation: Boating, Fishing, Swimming, and Jet-Skiing

Although lakes and streams attract visitors throughout central northern Wisconsin, no area compares with the density of lakes in the Northern Highland Pitted Outwash. Due to its location in this ecological unit, the NHAL is blessed with one of the highest concentrations of lakes in the world and is a major provider of public access to lakes in the region. The Vilas County Forest, Lac du Flambeau reservation, part of the Ottawa National Forest in Michigan, and a small parts of the CNNF also encompass lakes with public access. The Turtle-Flambeau and Willow Flowages provide public access to larger water-bodies. Several rivers in the region provide popular canoeing and fishing opportunities. Regionally, lakes with undeveloped shorelines are rare, and lakes with privately owned shorelines are facing strong development pressures.

The water resources of the NHAL are key to its recreational niche in the region. Visitors are drawn to the NHAL for its water resources in particular. The NHAL has over 900 lakes within its boundary. Sport fishing is a major recreational activity. Other popular water oriented recreation includes boating, swimming, water skiing, jet-skiing, canoeing and sightseeing. The NHAL has more than 100 designated boat launch sites. (See Map 6: Boat Landings on the NHAL.) It has nine designated swimming beaches, and hundreds of lakes popular for swimming. Many people come to the lakes for day use activities such as picnicking and boating. The NHAL has eight developed picnic areas. The NHAL also contains many undeveloped lakes. NHAL staff estimated that in 2001 there were about 340,000 boaters and anglers, 150,000 swimmers and picnickers, and 22,000 canoeists.

Camping

Regional camping inventory data shows that the public and private sectors each serve a different niche. Approximately 250 backcountry sites, 1800 rustic sites, 730 modern sites, and 3700 fully developed sites are located in the region (see below for definitions¹⁵). The public sector provides the bulk of the modern campsites, all of the rustic and backcountry sites, and no fully developed sites. The national forests offer two-thirds of the rustic campsites and about 20 percent of the modern and backcountry sites in the region. National forests also allow camping in undesignated campsites. State scenic waters areas (Turtle-Flambeau and Willow Flowages) provide one-third of the region's backcountry campsites. The NHAL provides about half of the modern and backcountry campsites and one third of the rustic campsites in the region. The NHAL does not provide any electrified campsites. Private campgrounds provide nearly all of the fully developed and only a small portion (6%) of the modern camping opportunities in the region. Private fully-developed campsites with electricity are particularly common in Vilas and Oneida Counties which have 1400 and 1300 campsites, respectively, out of the regional total of 3700.

The NHAL provides a variety of backcountry, rustic, and modern non-electrified campsites. The NHAL offers 18 family campgrounds with approximately 900 campsites, plus two outdoor group camping areas that can accommodate a total of 100 people. Most of the campgrounds are small. Two thirds have about 50 or fewer campsites and the two largest have roughly 100 sites. Just over one third of the NHAL's campsites (349 sites in four campgrounds) are served by showers and flush toilets, but not electric hook-ups. The remaining campgrounds are rustic style with only the basic amenities, such as hand-pumps for water and pit toilets. Five campgrounds offer special facilities for disabled campers. In addition to campgrounds, 131 remote canoe and wilderness (backpack) campsites are scattered across the NHAL for people wanting less social, more primitive camping conditions. Hunter camping is available in the traditional deer season.

The demand for camping on the NHAL is high, and the campgrounds are full nearly all summer. Crystal-Muskie, Clear Lake, and Firefly Lake, three large campgrounds with flush toilets and showers, are at capacity almost all summer long. Space is often available somewhere in the fourteen rustic family campgrounds, but most rustic campgrounds fill up quickly as well. Canoe and backpack sites are also highly sought-after. The length of stay on the NHAL is longer than at other state campgrounds. Many campers return generation after generation to their favorite

¹⁵ **Backcountry campgrounds** – single, remote campsite or small number of campsites, usually walk-in or canoe-in, and pit toilet; **rustic campgrounds** – offer less than 75 sites with enclosed pit toilets and hand pump water; **modern campgrounds** – generally offer more than 75 sites with modern amenities, such as flush toilets, showers, and sometimes electricity; **fully developed campground** – offer all features of a modern campground plus one or more of the following amenities: pool, laundry, concessions, game room, or bar/restaurant.

campsites and stay for one or two weeks. In total, the NHAL hosts nearly 300,000 campers annually.

Non-Motorized Trails and Off-Trail Opportunities

All of the recreation providers in the region generally offer similar types of non-motorized trails, such as hiking, biking, and cross-country skiing, in differing quantities. To a large degree the mileage of trail available can be attributed to the relative differences in the size of providers' land bases and their management priorities.

Within the region (six counties plus the entire Chequamegon-Nicolet National Forest) designated trails include about 110 miles of interpretive trails, 570 miles of horse trails, 1570 miles of mountain bike trails, 1800 miles of cross-country ski trails, 2020 miles of hiking trails, and several paved bike trails. Many trails are open to multiple uses. The largest provider of hike, bike, and cross-country ski trails in the region is the national forest. The Chequamegon Unit has 580 miles of trail open to hiking/biking/skiing and the Nicolet Unit has 480 miles. County forests offer a range of non-motorized trail opportunities. Vilas County Forest has 90 miles of hike/bike/ski trails, while Oneida County Forest has about 40 miles of hike and ski trails and 11 miles of bike trails. Iron County Forest has 100 miles of bike trail, while other county forests have less than 25 miles of mountain bike trails. The NHAL provides a small percentage of the designated non-motorized trails in the region, with 4% of the cross country ski trails, 4% of the hiking trails, and 2% of the mountain bike trails. However, the NHAL provides 15-25% of the non-motorized trails in Vilas and Oneida Counties. Thus the NHAL is not a significant regional provider of non-motorized trails, but is one of the main providers of recreational trails in Vilas and Oneida Counties. The nearby 25 mile Bearskin State Park Trail fulfills a somewhat different niche, providing an wide, easy surface for hiking, biking, and snowmobiling. The town of Boulder Junction operates a paved bike trail within the NHAL boundary. The private sector (which includes clubs, non-profit organizations, and commercial operations) provides hiking, cross-country skiing, and the only downhill skiing in the region. Many of these trails are on public land and are operated by cooperative agreements.

Overall, opportunities to engage in trail-type activities on non-designated forest roads and trails on public land far exceed those of the designated trails. Logging roads and other non-designated trails on state, federal and county lands are generally open to non-motorized recreational uses such as hiking, mountain biking, horseback riding, cross-country skiing and snowshoeing. Some forest roads are open to motor vehicles while others are bermed or gated as closed. Motor vehicles keep many trails and roads from growing over with vegetation. Typically, the size of the national, state, and county forests will determine the extent of non-designated trail opportunities. On the NHAL, hundreds of miles of logging roads are open to the public.

Non-motorized trails on the NHAL are popular, easily accessible, and help draw visitors to the property. Four nature (interpretive) trails total about seven miles and designated hiking trails total 18.5 miles. Thirty-two miles of mountain bike trail and 70 miles of cross-country ski trail are available. Hikers can use these trails, as well. Hundreds of miles of logging roads and non-designated trails are open for all types of non-motorized uses like hiking, cross-country skiing, mountain biking, horseback riding, and snowshoeing. NHAL staff estimated that in 1998 there were 58,000 mountain bikers, 29,000 hikers, and 6,000 horseback riders. Staff estimated 57,000 cross-country skiers in 1996 and only 9,000 in 1998, due to variable snow conditions.

Motorized Trails and Off-Trail Opportunities

Snowmobiling and ATV riding are the two main types of motorized trail recreation in central northern Wisconsin. The 3380 miles of snowmobile trails in the region far exceeds the mileage for any other trail type. The national forest has about 510 miles of snowmobile trail in the Chequamegon and 520 miles in the Nicolet. The NHAL has about 400 miles of snowmobile trail, which is more than twice as many miles of snowmobile trail per acre of land than in the national forest. County forests, tribes, and private landowners also contribute hundreds of miles of snowmobile trails in the region. The Lac du Flambeau Reservation has over 80 miles of snowmobile trails.

Opportunities for ATV recreation vary by location and landowner in the NHAL region. (See Figure 8 and Map 7: Designated All Terrain Vehicle (ATV) Trails and Road Routes.)

Figure 8. Designated ATV Trails and Road Routes in the Region (miles) (1)

	Year-Round Trails	Winter Only Trails	Summer Only Trails	Road Routes	Total
Chequamegon Unit Boundary (not including Price Co.) (2)	172	32	0	154	358
Forest	6	8	0	**	14
Iron	63	0	42	224	329
Lincoln	13	167	0	39	218
Nicolet Unit Boundary (not including Forest and Vilas Cos.) (2)	0	0	13	47	60
Oneida	13	6	0	75	94
Price	86	15	11	86	199
Vilas	0	0	0	0	0
Grand Totals	353	228	66	625	1272

Source: WDNR ATV trails database, 2002.

(1) ATV trail mileages are subject to frequent changes and should not be viewed as exact. Road routes were included when data was available.

**Forest County road routes open to ATVs are not included due to lack of mileage information.

(2) The mileages for the Chequamegon and Nicolet Units of the CNNF include all trails and road routes within the property boundary. The road routes are outside of the jurisdiction of the national forest. The summer-only trail within the Nicolet Unit is not owned or operated by the national forest.

In addition to these trails, almost 800,000 acres on the Chequamegon and part of the Iron County Forest are open to cross-country ATV riding. In Oneida County Forest, ATVs can also travel on any unpaved forest road not closed to motorized traffic. (Watkins et al. 2001) These represent undesignated trail opportunities.

ATV riding has been gaining in popularity statewide over the past decade, with Wisconsin registrations increasing from 41,600 in 1990 to 160,500 in 2001. ATV trails have been designated on county forests, the national forest, and state land. ATV road routes are typically designated by a town board, and can be part of a regional ATV trail network as in Iron County, or serve riders locally without regional connections. The Chequamegon-Nicolet National Forest (CNNF) is the most significant provider of ATV trails in the region. Currently, 80% of the Chequamegon Unit is

open to cross-country ATVing and the Chequamegon Unit also operates about **200** miles of summer and winter ATV trails. However, no ATVs are currently allowed on the Nicolet Unit. The CNNF Master Plan is being revised. In the range of alternatives being examined for the new master plan, most alternatives allow for some level of ATV trails on the Nicolet, eliminate cross-country access on the Chequamegon, and increase the number of trails on both units of the national forest. (USDA Forest Service 1999)

While in some places such as Iron County the county and towns have developed an ATV trail and road route system, in Vilas County the county and local governments have not. The Vilas and Oneida County Outdoor Recreation Plans list off-road motor vehicles as a medium priority need and do not mention plans for new trails. ATV trails and road routes currently border the NHAL on only one side, in Iron County. Thus the NHAL is not needed to connect existing ATV trails. While about 1270 miles of trails and road routes exist in the region, and more are proposed in the future on the national forest, Vilas County and the Nicolet Unit currently have no ATV trails.

The NHAL is a significant regional and local provider of snowmobile trails. The 400 mile snowmobile trail system is extensive, popular, and well-maintained. The Highland Trail is the backbone of the NHAL trail system, and links Boulder Junction with Lake Tomahawk. Obviously, snowmobiling activity varies with snow conditions. NHAL staff estimated that snowmobilers fluctuated between 175,000 in 1996 and 42,000 in 1998. The NHAL does not have ATV trails.

Hunting and Trapping

Over one half of the 4 million total forested acres in the region are open to public hunting and trapping. Because of its large size, the national forest provides the majority of hunting opportunities, with 52% of the region's public hunting land. Seventeen percent of public hunting land is county/municipal forest, 16% is industrial forest, 7% is NHAL, 5% is private non-industrial forest, and 3% is other state land.

High and moderate quality habitat for deer includes aspen, oak, jack pine, birch, and balsam fir forest types, and for ruffed grouse includes aspen, paper birch, and balsam fir. In lands open to public hunting in the region, about 50% of the forests are high to moderate quality habitat for deer, and about 35% are high to moderate quality habitat for ruffed grouse. About 70% of tribal land, 55% of the NHAL, 45% of county forests, 40% of the national forest and non-industrial private forests, and 35% of industrial forest land is good to moderate quality habitat for deer.

Due to the diverse forest types on the property, including aspen, white birch, red oak, and red and white pine forests, the NHAL provides a variety of forest game habitat. Just over 50% of the NHAL is high to moderate quality deer habitat, and 45% is high to moderate quality ruffed grouse habitat. Although the NHAL provides a relatively small amount of land in the region, general observations suggest that hunting pressure per acre is greater there, due to its high visibility, familiarity, good quality habitat, and ready access. There are abundant small game and big game hunting and trapping opportunities on the NHAL. Each fall the NHAL State Forest draws hunters from across the state, the midwest, and even the nation for gun and archery deer hunting, in particular. Ruffed grouse, woodcock and other small game hunting are also popular. NHAL staff estimated that in 1998 there were about 178,000 hunters.

Wild Resources Recreation

Wild or wilderness recreation emphasizes quiet, solitary experiences with few to no facilities, motors, or signs of management activities. The majority of wild-land recreation opportunities in the region are found on the national forests. The national forests provide 44,000 acres of designated wilderness, 16 semi-primitive non-motorized areas that total more than 68,000 acres, and 12,000 acres of additional non-motorized areas. The remaining lands with some type of wild resource designation are on state properties. The 2,275 acre wild area on the Turtle-Flambeau has limited public motor access and is adjacent to the 5,460 acre Manitowish Wilderness Area on the NHAL. The Willow Flowage Scenic Waters Area has about 10,000 acres of forest production land with restricted public motor access.

Currently the wild resource recreation lands on the NHAL include the Manitowish Wilderness Area and a total of 27,900 acres of wild areas with timber management but limited motor vehicle access.¹⁶ The NHAL also has 19 wilderness lakes and 41 wild lakes, which are quite rare regionally.

FINDINGS

Central northern Wisconsin is blessed with abundant, high quality outdoor recreational resources. It is an area with one of the greatest densities of lakes and bogs in the world, and at its heart lies the NHAL State Forest. The region around the NHAL truly is an outdoor lover's paradise. In addition to hundreds of lakes and streams for fishing, swimming, and boating, there are abundant camping opportunities ranging from primitive sites to fully developed RV campgrounds, over 2.5 million acres of public hunting land, hundreds of miles of trails of all types, and many more miles of undesignated logging roads and trails open to the public. Recreation in the region is rounded out by a thriving tourist business made up of resorts, restaurants and other tourist attractions. It's no surprise that this region is a top recreational destination for residents from the state and throughout the midwest.

A look at the distribution of recreation opportunities across the region shows that the national forest, the largest public landowner, is the primary recreation provider. It leads in rustic camping, all types of trails, public hunting, ATV riding, and wilderness recreation opportunities. The county forests rank second in the region, primarily providing various motorized and non-motorized trails and public hunting. The private sector's recreational niche is most sharply defined. It has nearly all the fully developed camping (RV campgrounds) in the region, as well as the commercial tourist services. Recreators generally consider state forests to be somewhat more developed than national forests, but less developed than state parks. State forests are considered a primary provider of silent-sport recreational opportunities in northern Wisconsin. State forests also tend toward a rustic camping experience.

As Wisconsin's largest state forest, the NHAL fills a special role in the region. The NHAL and nearby tourist service area of Minocqua-Woodruff offer a complete package – this has long been a

¹⁶ Wild Resources Areas, rather than wilderness or wild areas, will be designated in the next plan. Unlike wild areas, Wild Resources Areas will have no management activity except for restoration or control of exotic species, and no roads or motorized trails.

major vacation destination area. It offers visitors an exceptional combination of diverse forests, lakes, and streams, along with a range of quality outdoor recreational opportunities in a readily accessible location. Local residents have made recreation on the NHAL a part of their lifestyle. Due to the many lakes and streams on the NHAL it is a leading provider of water recreation in the region. Though the NHAL provides only a small percentage of land open to public hunting, it's quite popular due to its diverse, high quality habitat and high visibility, familiarity, and ready access. The NHAL is also an important provider of wild resources recreation, especially wild/wilderness lakes which are rare in the region. The NHAL is only a minor provider of designated trail opportunities in the region, except for snowmobile trails. Undesignated trail opportunities are widely available on the NHAL. In terms of total number of campsites, the NHAL trails slightly behind the national forest, but it offers the most balanced array of non-electrified camping in the region.

Issues of crowding, safety, and user conflict impact many recreators. Recent surveys suggest that for campers crowding, noise and heavy competition for campsites are becoming issues, particularly in modern campgrounds. Many forest users recognize that backcountry and rustic camping opportunities are limited in the region and believe present levels on the NHAL should not be reduced.

Safety and user conflicts are concerns for individuals such as hikers and bikers on shared trails, swimmers and jet-skiers in the same area, and snowmobilers who worry about congestion and high speeds on forest trails. (Watkins et al. 2001) ATV access is a growing issue as ATVs are not currently allowed on the NHAL, while ATV riders are looking for riding opportunities on the property. This is a change opposed by many non-motorized recreational NHAL users. Because ATV trails and road routes currently border the NHAL on only one side in Iron County, the NHAL is not needed to connect existing ATV trails.

Even with two million visitors each year NHAL visitation is generally increasing and growth is expected to continue, with annual fluctuations due to weather and other factors. Demand is expected to rise due to increased visitation by out-of-state visitors, more frequent visits by retirees who have more time available to recreate, more visits by people who have moved to the north to be closer to their favorite recreation sites, and an increased use of public lands because of declining access to non-public lands due to development. According to staff estimates the greatest growth in recent years was in numbers of people hunting, fishing and boating. The activities showing the most rapid growth on the NHAL are hiking and canoeing. The spring and fall shoulder seasons are becoming more popular. Campgrounds are consistently filled and campers looking for modern campsites are turned away in the summer.

The NHAL offers a unique recreational experience in a region rich in outdoor recreational opportunities. In contrast with the national and county forests, the NHAL offers a greater variety and abundance of forest and water-based recreation in close proximity to tourist centers. The lakes especially set the NHAL apart for recreation in central northern Wisconsin.

FINDINGS

The Northern Highland-American Legion State Forest plays a significant role in central northern Wisconsin. Although the NHAL makes up only 5% of the land in the six-county region, it stands out for having a density of lakes among the highest in the world, being the largest public property in an area with extensive dry forest communities, and offering a diverse “recreation package” near one of the most rapidly developing tourist centers in the region.

The abundance of kettle lakes on the NHAL draws recreators from across the state and the midwest for boating, fishing, and swimming. These same lakes provide excellent habitat for large concentrations of eagles, osprey, and common loons. Lakeshore development has been rapid in the region, with heavy pressure from the booming housing market in particular. As tourism and development increase, the undeveloped lakes of the NHAL and the availability of non-motor lakes will become even more prized than they are today.

The NHAL is the largest public property in the Northern Highland Pitted Outwash, an ecological subsection that stands out in the region for its sandy soils and rolling outwash topography. The size, location, and ecological capabilities of the NHAL and the objectives of other landowners indicate that the NHAL represents the best opportunity on public land for a major long-term restoration of a red and white pine dominated forest with a mix of aspen, birch, red oak, and jack pine. The wetlands and aquatic habitats of the NHAL represent highly significant opportunities for protection and management of rare and biologically diverse communities on both site-specific and landscape scales. The NHAL is also important at a larger scale, providing connections to national, county, and state properties and other large blocks of forest. The possible boundary expansion presents an opportunity to connect with the Ottawa National Forest .

Public outdoor recreation in central northern Wisconsin is provided by a mix of federal, state, county, tribal, and private landowners. The region offers high quality forest and water-based recreation. Increasingly, recreational providers will need to work together—each providing that part of the recreational pie that they can best provide—in order to meet the region’s wide and ever-growing outdoor recreation demands. Recreators generally consider state forests to be somewhat more developed than national forests, but less developed than state parks. State forests are considered a primary provider of silent-sport recreational opportunities in northern Wisconsin. State forests tend toward a rustic camping experience.

The NHAL and nearby tourist service area have long been a major vacation destination area. The NHAL offers visitors an exceptional combination of diverse forests, lakes, and streams along with a range of quality outdoor recreational opportunities in a readily accessible location. Due to the many lakes and streams, water recreation on the NHAL is popular. Though the NHAL provides only a small percentage of land open to public hunting, it is popular due to its diverse, high quality habitat and high visibility, familiarity, and ready access. The NHAL is also an important provider of wild resources recreation, especially wild/wilderness lakes, which are rare in the region. The NHAL is only a minor provider of designated trail opportunities in the region, except for snowmobile trails. However, it is one of the major trail providers in Vilas and Oneida Counties. In terms of total number of campsites, the NHAL is slightly behind the national forest, but it offers the most balanced array of non-electrified camping in the region. ATV access is a growing issue as ATVs are not currently allowed on the NHAL, while ATV riders are looking for riding opportunities on the property. This is a change opposed by many non-motorized recreational

NHAL users. Because ATV trails and road routes currently border the NHAL on only one side in Iron County, the NHAL is not needed to connect existing ATV trails.

People and households in rural resource-dependent regions of Wisconsin have traditionally relied upon the natural resource base for economic sustenance. The NHAL lies at the heart of central northern Wisconsin, supporting local communities through both forest products and forest and water-based recreation. Management of the forest has an impact on the socioeconomic ties that bind residents and visitors to the resources of the forest. A recent study shows that timber production and recreation are generally compatible land uses.

While some efforts have been made to educate visitors on the cultural and historical resources of the area, more opportunities are available to incorporate cultural resources into education and outreach efforts on the NHAL, linking the state forest with local tribes, landmarks, and the history of Native Americans, loggers, pioneers, and early visitors. Natural resources education is available in the region through school programs, camps, and interpretive programs. The NHAL has an opportunity to expand its facilities to educate the public on natural resources and forest management.

Given the increasingly complex nature of natural resources management, understanding the niche of the NHAL in its region is critical. As Wisconsin's largest state forest, the NHAL has a significant role to play in providing ecological, economic, recreational, and cultural benefits to the region.

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APPENDIX A

Biotic Inventory of the NHAL

- Over 200 occurrences of 22 natural community types
- 350 terrestrial vertebrate species
- 30 species of major trees
- 1,200 plant species
- 67 rare animal species:
 - one US Endangered (timber wolf),
 - one US Threatened (bald eagle),
 - one WI Endangered, nine WI Threatened, 57 WI Special Concern
- 34 rare plant species:
 - one WI Endangered, three WI Threatened, 30 WI Special Concern

Community Restoration and Old Growth Assessment Results

Opportunities for Old Growth

White pine
Red pine
Hemlock-hardwood
Northern hardwood
Red oak

Opportunities for Restoration

White pine
Red pine
Hemlock-hardwood
Tamarack
Jack pine

Potential Old Growth Sites on the NHAL

52 ranked sites (30,950 acres) **
Many small, scattered sites (4,732 acres)

**In essence, old growth forests are those forests that are relatively old and relatively undisturbed. The CROG team identified management strategies to promote different types of old growth characteristics, including no active management, low intensity management, and active intensive management using extended rotations. The candidate old growth sites have inclusions of other areas (wetlands, aspen, roads) not considered for old growth.

APPENDIX B: MAPS

Map 1: [Northern Highland-American Legion State Forest Region](#)

Map 2: [Land Ownership in the NHAL Region](#)

Map 3: [Ecological Subsections in the NHAL Region](#)

Map 4: [Statewide Eagle and Osprey Nest Distribution](#)

Map 5: [Northern Highland-American Legion State Forest Primary Sites \(1992-96\)](#)

Map 6: [Northern Highland-American Legion State Forest Boat Landings](#)

Map 7: [All Terrain Vehicle \(ATV\) Trails and Road Routes around the NHAL Region](#)